

National Park Service
U.S. Department of the Interior

Lava Beds National Monument
Tulelake, CA 96134



Lava Beds National Monument

Fire Management Plan – Environmental Assessment

September 2004



Fire managers at Lava Beds National Monument conduct a research burn to study the effects of prescribed fire on native and non- native vegetation, October 2003.

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Tulelake, California 96134**

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Chapter 1 – PURPOSE AND NEED

1.1 Introduction

This Environmental Assessment (EA) documents the results of a study of the potential environmental impacts of an action proposed by the National Park Service (NPS) to amend the existing Lava Beds National Monument Fire Management Plan.

This plan has been prepared in compliance with:

- The National Environmental Policy Act (NEPA) of 1969 (42 United States Code (USC) 4321 et seq.), which requires an environmental analysis for major Federal Actions having the potential to impact the quality of the human environment;
- Council of Environmental Quality Regulations at 40 Code of Federal Regulations (CFR) 1500-1508, which implement the requirements of NEPA;
- The National Historic Preservation Act (NHPA) (16 USC 470 et seq.), which requires protection of historic properties significant to the Nation's heritage;
- The Wilderness Act (16 USC 1131 et seq.), which requires the preservation of wilderness character and wilderness resources in an unimpaired condition for the monument's 28,460 acres of Congressionally designated wilderness;
- The Endangered Species Act of 1973 (ESA) (19 U.S.C. 1536 (c), 50 CFR 402), which requires that the effects of any agency action that may affect endangered, threatened, or proposed species must be evaluated in consultation with either the USFWS or NMFS, as appropriate;
- NPS Conservation Planning, Environmental Impact Analysis, and Decision Making; Director's Order #12 and Handbook.

Key objectives of NEPA are to help Federal agency officials make well-informed decisions about agency actions and to provide a role for the general public in the decision-making process. The study and documentation mechanisms associated with NEPA seek to provide decision-makers with sound knowledge of the comparative environmental consequences of the several courses of action available to them. In this case, the Superintendent of Lava Beds National Monument is faced with a decision to amend the Monument's Fire Management Plan as described by the alternative actions listed in Chapter 2 of this EA.

In making decisions about National Park Service administered resources, the Park Service is guided by the requirements of the 1916 Organic Act which states the agency's purpose: "to promote and regulate the use of national parks in conformance with their fundamental purpose which is to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." This authority was further clarified in the National Parks and Recreation Act of 1978: "Congress declares that...these areas, though distinct in character, are united...into one national park system.... The authorization of activities shall be construed and the protection, management, and administration of these areas shall be conducted in light of the high public value and integrity of the National Park System and shall not be exercised in derogation of the values and purposes for which these various areas have been established, except as may have been or shall be directly and specifically provided by Congress."

The requirements placed on the National Park Service by the Organic Act and other environmental laws, mandate that resources are passed on to future generations “unimpaired” (DOI, 2001). This EA addresses whether the actions of the various alternatives proposed by Lava Beds National Monument significantly impact, and possibly impair, resources or values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of the monument, (2) key to the natural or cultural integrity of the monument or opportunities for enjoyment of the monument, and (3) identified as a goal in the monument’s general management plan or other National Park Service planning documents.

1.2 Purpose and Need

Wildland fire has long been recognized as one of the most significant natural processes operating within and shaping dry- conifer and shrub- steppe ecosystems of North America (Brown & Smith 2000, Johnson and Smathers 1976). All of the major plant communities in the monument show evidence of fire dependence or tolerance (Miller et al 2003, Erhard 1979, Johnson and Smathers 1976). At the same time wildland fire has the potential to threaten human lives and property. Consequently there is a need to manage wildland fire so that threats to humans and property are reduced, while at the same time restoring and/or maintaining its function as a natural process.

NPS policy directs that every park unit having vegetation capable of burning must have a fire management plan, and that the fire management plan must be accompanied by an environmental assessment to document the environmental consequences of the proposed actions (NPS Director’s Order 18). Lava Beds National Monument first applied fire in a research context in 1974, and formalized its fire program with a management plan in 1982. Additional fire management activities were assessed and documented in an EA and plan in 1992. The 1992 Fire Management Plan was most recently amended in 2000 to comply with national policy changes.

The fire management program at Lava Beds National Monument does not stand alone, but implements direction provided in higher level policy and planning documents such as:

- *NPS Management Policies* (2001),
- Lava Beds National Monument General Management Plan (1996),
- Lava Beds National Monument Resource Management Plan (1999),
- Federal Wildland Fire Management Policy and Program Review (2001),
- The National Fire Plan (based on *Managing the Impact of Wildfires on Communities and the Environment, A Report to the President in Response to the Wildfires of 2000*),
- A 10- Year Comprehensive Strategy (*A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment*).

The monument is currently using a fire management plan and environmental assessment written in 1992. There is a need to amend the 1992 Fire Management Plan to be in compliance with these recently developed and/or updated policy and planning directives.

1.3 Background

Lava Beds National Monument was established on November 21, 1925 to preserve the unique geological, natural, and historical features of the local landscape.

The monument occupies 72 square miles within Siskiyou and Modoc counties in northeastern California, and is the site of the largest concentration of lava tube caves in the United States. The monument lies roughly 40 miles east of the crest of the southern Cascades on the northern flank of the Medicine Lake Highlands and exhibits elevations from 4000 to 5700 feet (1219 to 1737 meters). The region in and around the monument is unique because it occurs at the junction of the Sierra-Klamath, Cascade, and Great Basin geologic provinces. (See **Figure 1-1**).

In addition to its geologic features, the monument encompasses the main battlefields of the Modoc War of 1872-73, the only Indian war fought in California. Lava Beds National Monument also includes Petroglyph Point, one of the largest panels of Native American rock art in the United States. The monument also protects 28,460 acres of high desert wilderness.

On average, more than 125,000 people visit the monument each year. The monument provides opportunities for visitors to learn about volcanism, the high desert environment, anthropogenic uses and historic battlefields; and to enjoy various recreational pursuits such as sightseeing, camping, picnicking, and hiking.

In order to preserve and protect the natural and cultural resources found at Lava Beds National Monument, the Fire Management Plan has identified the desired future target goal for the ecosystems within the monument to be focused on restoring conditions found prior to 1872. This target condition is based on fire research, resource management studies, and historic documentation. This target condition may change in the future with results of new research and studies focused on fire ecology and historic cultural landscape patterns. Throughout the remainder of the document natural conditions will refer to the 1872 target.

1.4 Fire Management Goals

The purpose, goals and objectives of the monument's fire management program are derived from agency mandates, policy statements, environmental laws and monument planning documents. The Fire Management Plan must respond to direction provided in Federal and NPS policy statements such as the 2001 Review and Update of the 1995 Federal Wildland Fire Management Policy (USDI and USDA 2001). The fire program must comply with laws such as the National Park Service Organic Act, Endangered Species Act, Clean Air Act, Clean Water Act, Wilderness Act, National Historic Preservation Act, Archeological Resources Protection Act, and other laws related to the National Park Service. The monument's General Management Plan (NPS 1996), Resources Management Plan (NPS 1999), and previous fire management plans also provide focused direction regarding monument-specific resources and stewardship goals.

Within the framework of these higher-level agency policies and environmental laws, the monument's staff has identified the following goals and objectives for the fire management program. These goals and objectives apply to each of the proposed alternatives and will be used to measure the success of the fire management program. Collectively, they form the purpose for proposing action:

Goal 1. Ensure the protection of human life and property both within and adjacent to the monument is the highest priority in all fire management activities.

Objective: Ensure all fire management activities sustain no injuries to the public and limit the number of annual injuries to fire personnel not to exceed 90% of the past five year average.

Objective: Within at least 60% of the monument's developed zones and interface boundary zones, change fuel conditions so that predicted flame lengths under 90th percentile fire danger conditions will be less than four feet by 2010.

Goal 2. Reduce fuel loadings, which have accumulated as a result of past fire exclusion, for the purpose of minimizing the chance of a catastrophic wildfire.

Objective: Identify and conduct fuel reduction treatments on at least 15% of areas having increased fuel loadings that have resulted from fire exclusion, by 2010.

Goal 3. Allow fire, as an ecosystem process in the biotic communities of the monument, to resume its natural role to the fullest practical extent, either through the careful application of prescribed fire or management and use of wildland fire.

Objective: Restore, and then maintain, the historic fire regime on at least 25% of the monument by 2013 using wildland fire use and prescribed fire, as measured by the fire return interval being within natural ranges.

Goal 4. Mitigate unacceptable environmental impacts on biotic communities and historical and cultural resources due to fire management operations.

Objective: Select and implement established resource management guidelines to mitigate unacceptable impacts on natural and cultural resources for 100% of all wildland fire operations.

Goal 5. Provide for the safe, aggressive and efficient suppression of all fires that do not meet resource management objectives by defining suppression responsibilities, organization levels, and decision-making processes.

Objective: Maintain a fire management organization during fire season that will safely contain 95% of all unwanted fires in the monument within 24 hours of initial attack efforts.

Goal 6. Maintain the historic scenes as identified in the Statement for Management and General Management Plan, and Cultural Landscape Inventories (when identified).

Objective: Negate adverse impacts on eligible historic properties and cultural landscapes during all fire management operations.

Goal 7. Promote an interagency approach to managing fires and minimizing costs of suppressing wildfires.

Objective: On an annual basis, meet with and review, update and initiate cooperative agreements to assure that interagency approaches to managing wildland fires are implemented.

Goal 8. Foster and inform public participation in fire management activities to enable the monument to respond appropriately to the needs of stakeholders.

Objective: Revise and implement the "Public Fire Information Plan" and "Prevention Plan", and provide educational programs to local communities and monument visitors annually.

Goal 9. Refine management practices by improving knowledge and understanding of fire through research and monitoring.

Objective: Record significant fire behavior and decisions, determine whether specific objectives are being met and assess fire effects on all wildland fire projects.

Objective: Solicit at least two high- priority fire research projects that support the national planning process for fire management decision- making, by 2009.

Goal 10. Park staff and visitors are protected from unhealthful levels of air pollution; and visibility within

the park is not significantly degraded from prescribed fires and/or wildland fires being managed to meet resource benefits.

Objective: During all prescribed fire and wildland fire for resource benefit projects, use strategies that will not exceed 80% of the state standards for carbon monoxide and particulates in smoke sensitive areas and do not degrade monument visibility for more than 4 consecutive days.

1.5 Scoping Issues and Impact Topics

The National Park Service held two public meetings to discuss proposed amendments to the Fire Management Plan and gather the public's concerns or issues with the proposal. The meetings took place in late February of 2002 in the neighboring communities of Tulelake, California, and Klamath Falls, Oregon.

The major issues and concerns that came from the open house and other public input (e.g. email, written correspondence) were evaluated and sorted. Issues determined to be important were those related to the effects of the proposed action, and those not already adequately addressed by laws, regulations, and policies. Important issues were considered in developing and evaluating alternatives to the Proposed Action.

1.5.1 Public Issues and Concerns

Public response to the Proposed Action included the following concerns:

- A high intensity fire could threaten visitors as well as individuals living near the monument;
- Wildland fire within the monument could have adverse impacts on cultural resources that may or may not be inventoried;
- Wildland fire may have adverse impacts on native plant populations and cause some alien plant species to expand within the monument;
- Air quality could be adversely affected by managed fire over large areas of the monument.

1.5.2 Impact Topics Evaluated in this Environmental Assessment

Impact topics were derived from issues raised during internal and external scoping. Not every conceivable impact of a proposed action is substantive enough to warrant analysis. The following topics, as determined by the interdisciplinary project team, did merit consideration in this environmental assessment. Table 1-1 summarizes the impact topics retained for analysis.

Human Health and Safety: Fires can be extremely hazardous, even life-threatening, to humans, and current federal fire management policies emphasize that firefighter and public safety is the first priority; all Fire Management Plans must reflect this commitment. Therefore, impacts to human health and safety are addressed in this analysis.

Air Quality: The Federal 1970 Clean Air Act stipulates that Federal agencies have an affirmative responsibility to protect a park's air quality from adverse air pollution impacts. Moreover, Lava Beds

National Monument is designated as a Class I area. All types of fires generate smoke and particulate matter, which can impact air quality within the monument and surrounding region to some extent. All of these considerations warrant the inclusion of impacts to air quality in this analysis. Air quality was voiced as a concern by members of the public.

Cultural Resources: Section 106 of the National Historic Preservation Act of 1966 provides the framework for Federal review and protection of cultural resources, and ensures that they are considered during Federal project planning and execution. The monument contains many cultural resource sites. These cultural resources can be affected both by fire itself and fire management activities, thus potential impacts to cultural resources are addressed in this analysis. Protection of cultural resources was voiced as a concern by members of the public.

Soil & Water Resources: NPS policies require protection of water resources consistent with the Federal Clean Water Act. Wildland fire and related management efforts can affect soil and water resources by exposing soils, which may lead to erosion during storm events and subsequent suspended solids and turbidity in downstream surface waters. Therefore, impacts to soil and water resources are evaluated in this analysis.

Vegetation: Since the plant communities in the monument are heavily influenced by fire regimes, this environmental assessment considers the impacts of the proposed FMP alternatives on the monument's native and non-native vegetation. The effects of proposed activities on the spread of non-native plants was voiced as a concern by members of the public.

Wildlife: There are resident populations of various species of reptiles, amphibians, birds, mammals, and invertebrates in the park, therefore, impacts of the FMP alternatives on wildlife are evaluated in this analysis. The Federal Endangered Species Act prohibits harm to any species of fauna or flora listed by the U. S. Fish and Wildlife Service (USFWS) as being either threatened or endangered. Such harm includes not only direct injury or mortality, but also disrupting the habitat on which these species depend.

Cave Resources: NPS policies require the protection of caves from the adverse effects of human activities. The monument is home to more than 500 lava tube caves. Because both biotic and abiotic cave resources have the potential to be adversely affected by wildland fire management activities, impacts to cave resources are included in this analysis.

Wilderness: The NPS wilderness management policies are based on provisions of the 1916 NPS Organic Act, the 1964 Wilderness Act, and legislation establishing individual units of the national park system. The public purpose of wilderness in national parks includes the preservation of wilderness character and wilderness resources in an unimpaired condition, as well as for the purposes of recreational, scenic, scientific, education, conservation, and historical use. Because the monument includes 28,460 acres of wilderness, this impact topic is evaluated in this environmental assessment.

Visitor Use and Experience: The 1916 Organic Act directs the Service to provide for public enjoyment of the scenery, wildlife and natural and historic resources of national parks "in such a manner and by such means as will leave them unimpaired for the enjoyment of future generations." Fire management activities can result in the temporary closure of certain areas and/or result in visual impacts that may affect the visitor use and experience of the park. Therefore, the potential impacts of the proposed FMP on visitor use and experience are addressed in this analysis.

Socio-economics: NEPA requires an analysis of impacts to the "human environment" which includes economic, social and demographic elements in the affected area. Therefore, this impact topic is included in this analysis.

Table I-1. Impact Topics Retained for Lava Beds National Monument
Fire Management Plan Environmental Assessment.

Impact Topic	Retained or Dismissed from Further Evaluation	Relevant Regulations or Policies
Human Health & Safety	Retained	NPS <i>Management Policies 2001</i> ; <i>Director's Order #18</i>
Air Quality	Retained	Federal Clean Air Act (CAA); CAA Amendments of 1990; NPS <i>Management Policies</i>
Cultural Resources	Retained	Section 106; National Historic Preservation Act; 36 CFR 800; NEPA; Executive Order 13007; Director's Order #28; NPS <i>Management Policies</i>
Soil & Water Resources	Retained	Clean Water Act; Executive Order 12088; NPS <i>Management Policies 2001</i>
Vegetation	Retained	NPS <i>Management Policies</i>
Wildlife	Retained	NPS <i>Management Policies</i> ; Endangered Species Act
Cave Resources	Retained	NPS <i>Management Policies</i>
Wilderness	Retained	The Wilderness Act; Director's Order #41; NPS <i>Management Policies</i>
Visitor Use and Experience	Retained	The NPS Organic Act; NPS <i>Management Policies</i>
Socioeconomics	Retained	40 CFR Regulations for Implementing NEPA; NPS <i>Management Policies</i>

1.5.3 Impact Topics Dismissed in this Environmental Assessment

NEPA and the CEQ Regulations direct agencies to “avoid useless bulk...and concentrate effort and attention on important issues” (40 CFR 1502.15). Certain impact topics that are sometimes addressed in NEPA documents on other kinds of proposed actions have been judged to not be substantively affected by any of the FMP alternatives considered in this environmental assessment. These topics are briefly described below including the rationale for considering, but excluding them, from further analysis.

Ecologically Critical Areas: The Council on Environmental Quality requires consideration of the severity of impact on unique characteristics of the geographic area such as proximity to ecologically critical areas (e.g. biosphere reserve, world heritage site, wild & scenic rivers). Lava Beds National Monument has no designated ecologically critical areas; therefore this topic is dismissed from further analysis.

Wetlands: Presidential Executive Orders mandate the protection of wetlands. Because there are no wetlands located within Lava Beds National Monument, this topic is dropped from further consideration.

Environmental Justice: None of the FMP alternatives would impact minority and low-income populations in a disproportionate manner. Therefore, this topic is dropped from additional consideration.

Waste Management: None of the FMP alternatives would generate noteworthy quantities of either hazardous or solid wastes that need to be disposed of in hazardous waste or general sanitary landfills. Therefore this impact topic is dropped from additional consideration.

Transportation: None of the FMP alternatives would substantively affect road, railroad, water- based, or aerial transportation in and around the park. One exception to this general rule would be the temporary closure of nearby roads during fire suppression activities or from heavy smoke emanating from wildland fires or prescribed burns. Over the long term, such closures would be very infrequent and would not significantly impinge on local transportation. Therefore, this topic is dismissed from any further analysis.

Utilities: Generally, some kinds of projects, especially those involving construction, may temporarily impact above and below- ground telephone, electrical, natural gas, water, and sewer lines and cables, potentially disrupting service to customers. None of the FMP alternatives will cause these effects to any extent; therefore utilities are eliminated from any additional analysis.

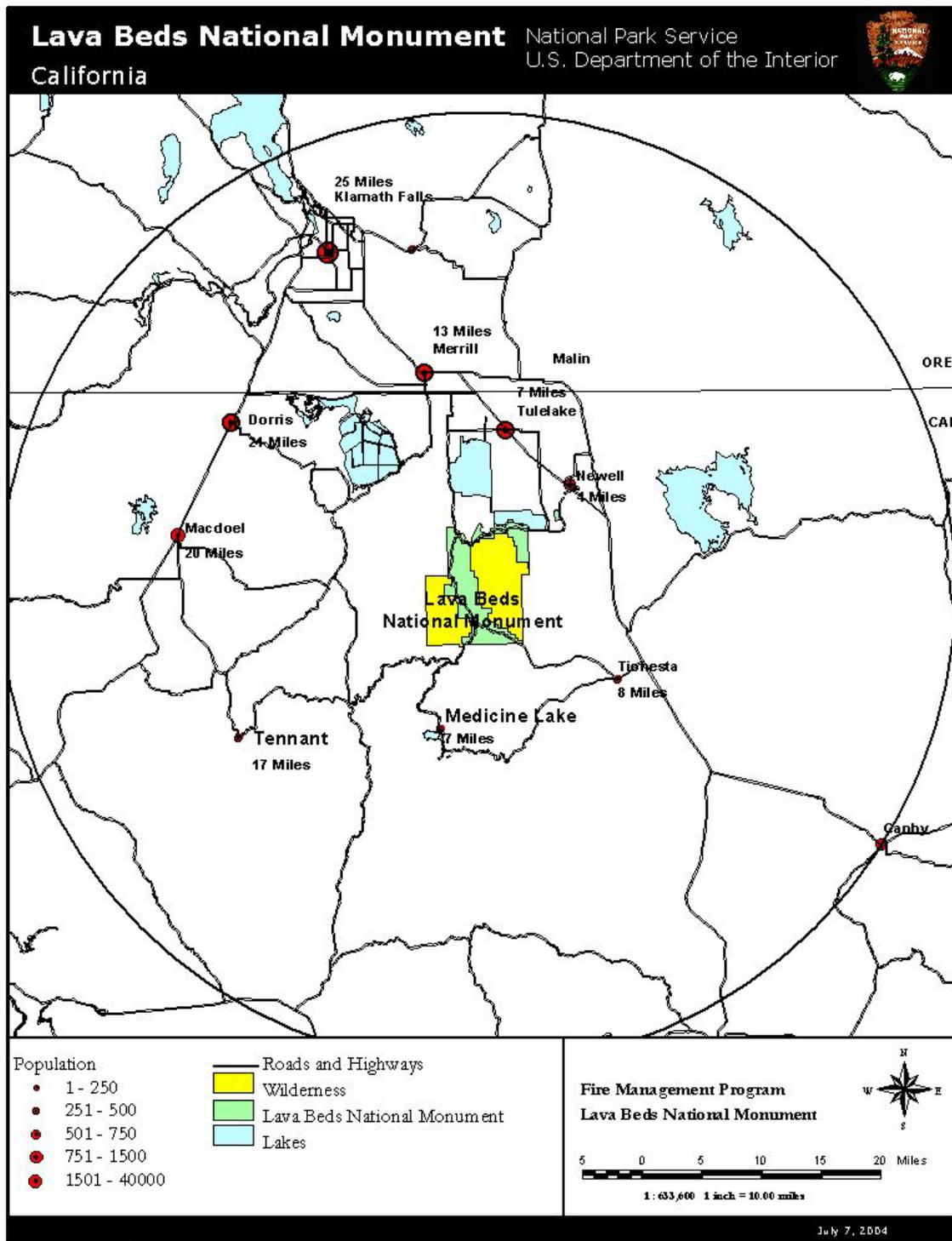
Land Use: Fire management activities would not affect land uses within the park or in areas adjacent to it. Therefore, this impact topic is not included for further analysis in this environmental assessment.

Prime and Unique Agricultural Lands: Prime farmland has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. Unique land is land other than prime farmland that is used for production of specific high- value food and fiber crops. Both categories require that the land is available for farming uses. Lands within Lava Beds National Monument are not available for farming and, therefore, do not meet these definitions. This impact topic is not evaluated further in this environmental assessment.

Indian Trust Resources: Indian trust assets are owned by Native Americans but held in trust by the United States. Indian trust assets do not occur within Lava Beds National Monument and, therefore, are not evaluated further in this environmental assessment.

Resource Conservation, Including Energy, and Pollution Prevention: The National Park Service's *Guiding Principles of Sustainable Design* provides a basis for achieving sustainability in facility planning and design, emphasizes the importance of biodiversity, and encourages responsible decisions. The guidebook articulates principles to be used such as resource conservation and recycling. Proposed project actions would not minimize or add to resource conservation or pollution prevention within Lava Beds National Monument and, therefore, this impact topic is not evaluated further in this environmental assessment.

Figure 1-1. Lava Beds National Monument and Vicinity.



Chapter 2 - ALTERNATIVES

This chapter describes the range of alternatives, including the Proposed Action and No Action Alternatives, formulated to address the purpose of and need for the proposed project. These alternatives were developed through evaluation of the comments provided by individuals, organizations, governmental agencies, and the monument's interdisciplinary resource staff.

2.1 Definitions

Several wildland fire management terms are used to describe the alternative courses of action analyzed in this EA. The following definitions are provided to help the reader distinguish the similarities and differences among and between the alternatives.

Wildland Fire - Any non- structure fire, other than prescribed fire, that occurs in the wildland.

Appropriate Management Response - Specific actions taken in response to wildland fire to implement protection and fire use objectives.

Fire Management Unit (FMU) - Any land management area defined by common objectives, land features, access, values to be protected, political boundaries, fuel types, or major fire regimes that sets it apart from an adjacent unit. FMUs are delineated in Fire Management Plans. These units have assigned management objectives and pre- selected strategies assigned to accomplish these objectives.

Fire Management Strategy - A set of objectives for managing fire that considers fire behavior, public and firefighter safety, resource protection, values at risk, legal constraints and cost efficiency.

Fire Management Tactic - Site-specific activities and techniques that are implemented to meet a selected strategy.

2.2 Fire Management Strategies Common to All Alternatives

Lava Beds National Monument proposes the following wildland fire management strategies as common to all of the alternatives. The particular mix of strategies and where they would be applied across the landscape are unique to each alternative, in response to the project needs and objectives, significant issues, and impact topics. Details of each alternative are described in section 2.4.

2.2.1 Wildland Fire Suppression

Wildland fire suppression is an appropriate management response to some wildland fires. Suppression includes the full range of tactics: confine, contain, and control. All suppression actions are implemented with firefighter and public safety as the highest consideration, but also seek to minimize loss of resource values, economic expenditures, and/or the use of critical firefighting resources. All suppression actions are guided by minimum impact suppression techniques.

Various fire suppression techniques are used to break the continuity of forest fuels, cool a fire, and slow the advance of a flaming front. Actions may include constructing fire lines; cutting vegetation; applying water, foam or retardant; and using fire to check, direct, or delay the spread of unwanted fire.

Historically, most park fires have been < 5 acres (86%) and can be suppressed using hand tools - sometimes supported with a chainsaw for cutting fuels, a fire engine or portable pump for delivering water; and/or a helicopter to transport water, supplies, and firefighters. Fires > 5 acres and small fires with a greater potential for spread, may require the use of drip torches, fuses, fire line explosives, retardant-filled aircraft or extensive water drops.

When determining suppression tactics, collateral damage to park resources as a result of the proposed suppression action is considered. Least cost or minimum acres burned are not the sole determining factors in choosing tactics. Considering public and firefighter safety first, tactics selected are those which create the least collateral damage to park resources.

It is NPS policy to avoid the use of fire retardant as much as possible. The use of heavy equipment, such as dozers, tractors, and tracked- vehicles, is prohibited without prior authorization of the Superintendent.

2.2.2 Prescribed Fire

Prescribed Fire is any fire ignited by management actions to meet specific objectives. Prescribed fire is applied to the landscape (< 5000 acres per treatment unit) under specified environmental conditions (e.g. weather and fuel moisture); and is confined to a predetermined area with a pre- determined range of fire intensity and rate of spread as documented in an approved prescribed fire plan. The fuels to be burned may be in either their natural or modified state (e.g. cut down and scattered or piled).

Individual burn units are prepared in a variety of ways including: digging hand line to mineral soil around the unit perimeter, pruning trees and shrubs with chainsaws, applying water to prevent fire spread, or using natural barriers such as snow, rock outcrops, roads and trails to enclose the unit in a controllable line. Personnel then light fuels in the unit using hand ignition devices such as fuses or drip torches. Aerial ignitions are commonly accomplished using a helitorch which dispenses a combination of gasoline and gelling agent; or by dispensing plastic spheres that ignite from an exothermic reaction between ethylene glycol and potassium permanganate crystals. Once ignited, prescribed fires are monitored and “held” by fire crews to ensure the fire is contained and controlled. Actions to control a prescribed fire include the use of fire engines and/or portable pumps for delivering water; and/or a helicopter to transport water, supplies, and firefighters.

2.2.3 Wildland Fire Use

Wildland Fire Use (WFU) is the management of naturally ignited wildland fires to accomplish specific pre- stated *[defined]* resource management objectives in predefined geographic areas. One of the basic premises of WFU is that every wildland fire will receive an “Appropriate Management Response.” Because every fire in the wildland is different, decisions need to be made that are appropriate for the management of each particular fire. Individual WFU projects will be limited to < 10,000 acres in size, and all WFU projects combined in a given year, will not exceed 20,000 acres.

Because of unique situations, such as the relative small size of the monument combined with unnaturally high fuel loading, Lava Beds National Monument has taken the basic definition of WFU and developed four general tactics for implementing various fire scenarios. These scenarios are the same for each alternative and were developed to enhance success in managing fires within the boundaries of the monument.

Each fire will have its own planning document, the Wildland Fire Implementation Plan (WFIP). In the WFIP, different tactical approaches can be implemented individually or by combining several, depending on the needs of the given fire. Depending on a fire’s complexity, a WFIP may include a Maximum Manageable Area (MMA) determination which could be developed for each tactic. The MMA delineates

the ultimate acceptable size for a given wildland fire. This is to ensure that there is a common understanding of the authorized size and location of the fire among agency administrators and cooperators.

Each tactical approach also takes into account the four factors involved in a Wildland Fire Risk Assessment:

- Implementation Risk- availability of resources, seasonal severity, fire objectives
- Ecological Risk- fire regime, fire effects, condition class
- Critical Concerns- internal/external involvement, social/political/economic impacts, fire duration
- Safety- tactical complexity, threats to life and property, fire behavior

Fire managers at the monument have developed responses to the following situations:

1. Monitoring of Free Roaming WFU.

Scenario: The fire is burning in a location where control concerns are minimal and easily mitigated, and fire behavior will produce desired fire effects.

Tactic: The fire is allowed to burn freely with little or no ground- disturbing activities. Fire may be monitored on site or from the air. The fire is allowed to burn unimpeded for its duration. Considerations for this tactic:

- Resources commensurate with complexity are readily available.
- Projected fire growth is in a naturally defensible area.
- Seasonal severity contributes to desired fire effects.
- Critical concerns are able to be mitigated.
- Minimal on- the- ground tactics increase safety

2. Herding the Fire.

Scenario: Fire is burning towards an identified control line on a section of the fire while it remains free burning on other sections. (A control line may be a road, trail, natural feature, stream, or constructed hand line that management has pre- identified.)

Tactic: The fire may be allowed to burn up to but not cross this line, and may be allowed to burn freely on other parts of the fire. On- the- ground actions may include the use of chainsaws and hand tools for removing fuels while constructing hand line, and improving the controllability of existing roads and trails. Portable pumps and fire engines may also be used to supply water. Helicopters may be used to support holding actions with water drops as well as air tankers on rare occasions; however, the use of retardant will need prior approval from a resource advisor. Handheld firing devices such as drip torches, fire quick flares and fuses may be used to burn out along a control line and aerial firing may be used to burn out where handheld devices are impractical. Considerations for this tactic:

- Resources commensurate with complexity are readily available.
- Seasonal severity contributes to desired fire effects.
- Ability to mitigate safety concerns through standard firefighting guidelines
- Projected fire growth and predicted fire behavior allow for tactical advantage in prepping and implementing herding tactic.
- Ability to mitigate critical concerns.

3. Management Controlled Growth.

Scenario: The fire is burning in an area that would provide resource benefits from the fire. The determining factor in using this tactic is when fire behavior predictions and fire growth simulations create concerns over the ability to maintain control of the fire for its duration. Many locations in the park that would create this scenario are some of the highest priority areas for getting fire back onto the landscape.

Tactic: Management would identify one or more Target Burn Areas (TBA) within the MMA. Each TBA would have defensible boundaries, either constructed or existing, and could be any size. The development of TBA's would mimic as much as practical, the fire growth predictions simulated through computer modeling (e.g. FARSITE, BEHAVE+). The TBA's perimeter or entire area may be burned under more manageable conditions such as after precipitation or periods of high relative humidity. After one TBA is burned and the fire spread is checked, the next TBA may be burned at the next opportunity. This could be immediately or later in the season, all depending on favorable burning conditions.

Considerations for this tactic:

- Resources commensurate with complexity are readily available.
- Seasonal severity/predicted seasonal severity may produce unwanted fire behavior.
- Resource benefit objectives can be met while meeting objectives of fire control.
- Undesirable fire effects may be mitigated by management controlled ignition.
- Many critical concerns can be mitigated through controlled ignition.
- Safety is increased through proactive, not reactive management.
- Threats to property or park boundary mitigated in pre planning.

4. Management Controlled Intensity.

Scenario: The fire is burning in an area that would provide resource benefits from the fire. The determining factor in this scenario is undesirable fire effects may occur due to hot burning conditions or the unnatural accumulation of fuels. The main objective of this strategy is mitigating the undesirable fire effects in areas that have missed several fire return intervals, or other areas that are in need of fire treatments at a lower intensity level. The goal would be that the next WFU in these areas would be more of a free roaming fire and require less intensive management.

Tactic: After fire growth predictions have been completed and an MMA has been determined, areas that may be at high risk for undesirable fire effects will be identified. This can be stands of similar vegetation types within the MMA, or can even be identified as an entire Target Burn Area.

One unique aspect of this scenario is that it can be employed as a part of a free roaming fire, one that is being herded, and can be used within management controlled growth or used only as a stand alone tactic. The identified areas may be ignited by management when fire conditions are favorable for desired fire effects, such as following a rain shower, times of high relative humidity, or taking advantage of early season burning conditions.

Considerations for this tactic:

- Resources commensurate with complexity are readily available.
- Seasonal severity/predicted seasonal severity may produce undesirable fire effects.
- Resource benefit objectives can be met while meeting objectives of fire control.
- Undesirable fire effects can be mitigated by management controlled ignition.
- Many critical concerns can be mitigated through controlled ignition.
- Safety is increased through proactive, not reactive management.
- Threats to property and the park boundary are mitigated in pre planning.

2.2.4 Manual/Mechanical Treatments

Manual treatment is the use of hand tools or hand operated power tools. Mechanical treatment is the use of heavy equipment and is not planned within the monument. Both are used to cut, clear or prune herbaceous and woody species to effectively reduce hazardous accumulations of wildland fuels and to create defensible space near structures and adjacent to private lands along the monument boundary. Within the monument, manual treatments could be used 1) to remove excess woody debris from the ground; 2) to remove “ladder” fuels, such as low limbs and brush (which could carry fire from the forest floor into the crowns of trees); and 3) to thin dense stands of shrubs adjacent to developed areas, to reduce the horizontal continuity of fuels. Material cut or gathered through manual/mechanical treatment would be cast back on site, be disposed of by piling and burning or depending on the size, quantity and location, may be chipped and/or removed from the site.

2.3 Alternatives Considered But Not Analyzed Further In This Environmental Assessment

Only one alternative was initially considered by the project interdisciplinary team and then later dropped from further analysis.

2.3.1 Use Managed Fire for Natural Resource Benefits

This alternative would amend the current FMP using predetermined parameters in which all ignitions would be managed to benefit natural resources. In addition, prescribed fire would be permitted. Although this alternative recognizes the beneficial role of fire in the ecosystem, an ignition in some areas could quickly escape the monument boundaries and/or threaten human life and property. Extremely extensive wildland hazard reduction activities need to occur before this alternative could be safely and effectively implemented.

2.4 Alternatives Considered and Analyzed In This Environmental Assessment

A total of three alternatives (including the No Action Alternative) were developed by the project interdisciplinary team in response to the identified purpose and need, project objectives, and relevant impact topics. The three alternatives are described in the following sections.

2.4.1 Alternative 1 (No Action) – Continued Implementation of the 1992 Fire Management Plan

This alternative meets the purpose and need by continuing the fire program according to the Fire Management Plan approved in 1992 and updated in 2000. The goals emphasized under this alternative are to:

- Allow fire, as an ecosystem process in the biotic communities of the planning unit, to resume its natural roll through the careful application of prescribed fire;
- Protect human life and property by defining suppression and fire prevention responsibilities, organization levels and decision- making processes, thus providing for the rapid, aggressive, safe and most effective fire suppression possible.

Under this alternative, the area within Lava Beds National Monument is managed as two Fire Management Units (see Figure 2- 1); the Control FMU and the Confine/Contain FMU.

The **Control Unit** includes areas adjacent to the boundary of the monument, and the area encompassing the monument’s administrative facilities. In this FMU, most wildland fire ignitions would receive an immediate suppression response.

The **Confine/Contain Unit** includes the majority of the two wilderness areas interior to the Suppression Unit. In this FMU, an appropriate management suppression response would be used that emphasizes the use of existing natural and man- made barriers to control the fire which would allow for the management of natural ignitions to restore and maintain natural fire regimes to a limited extent.

Within both Fire Management Units, prescribed fire and manual treatment activities would be implemented to reduce hazardous fuels, protect life and property and restore fire as an ecosystem process. Managing natural ignitions for Wildland Fire Use would NOT be implemented in either Unit under this alternative. Table 2- 1 summarizes the treatment acres by treatment type and Figure 2- 2 shows the proposed treatment areas.

Table 2- 1. Alternative 1 - Summary of Treatment Acres by Treatment Type.

Alternative	Treatment Type	Acres Per Year					5- Year Total Acres	5- Year Average Acres
		2004	2005	2006	2007	2008		
1 (No Action)	Prescribed Fire	914	1,152	5,288	2,372	356	10,082	2,016
	Manual	0	155	37	125	106	423	85

Figure 2-1. Alternative 1 (No Action) – Continued Implementation of the 1992 Plan,
Fire Management Units.

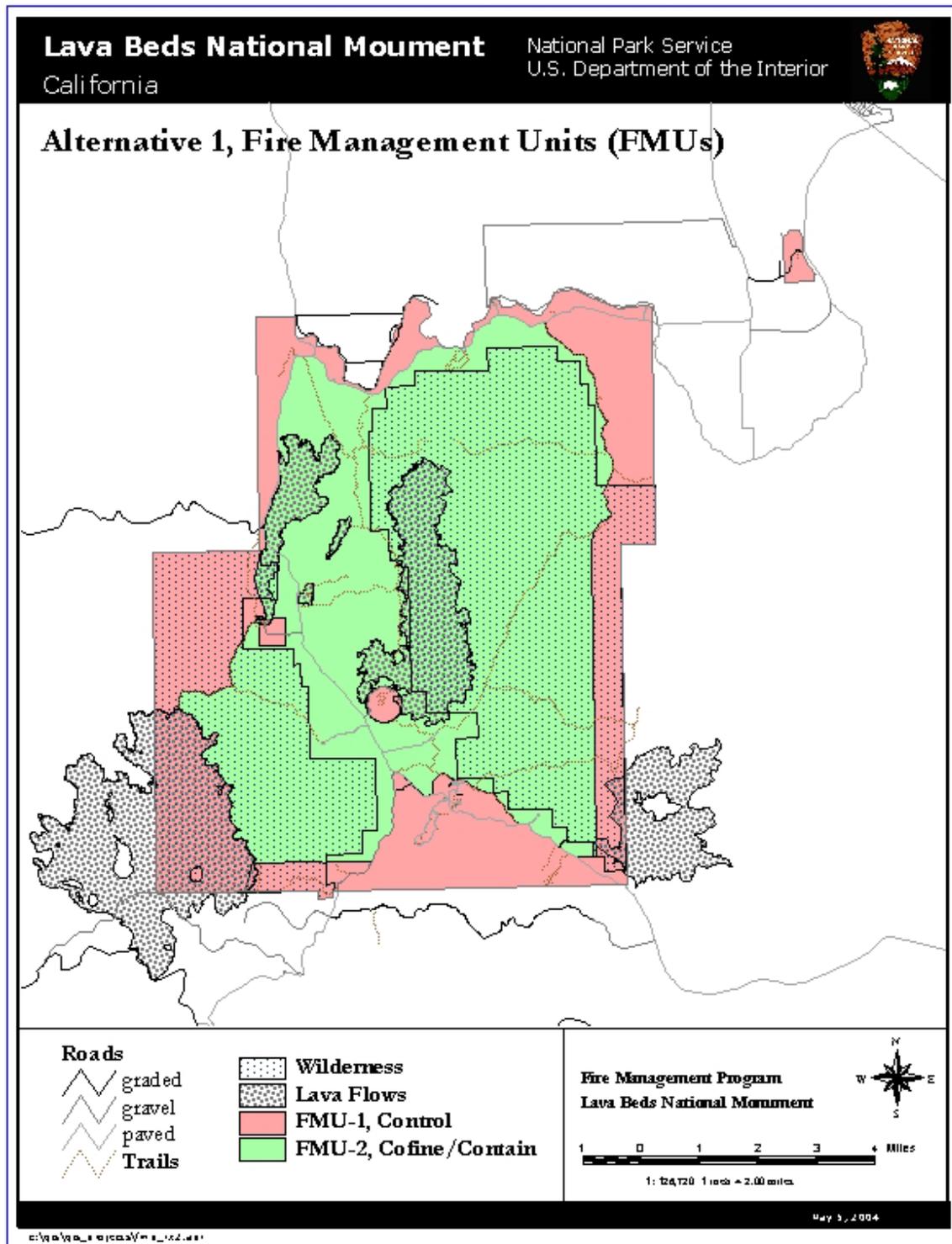
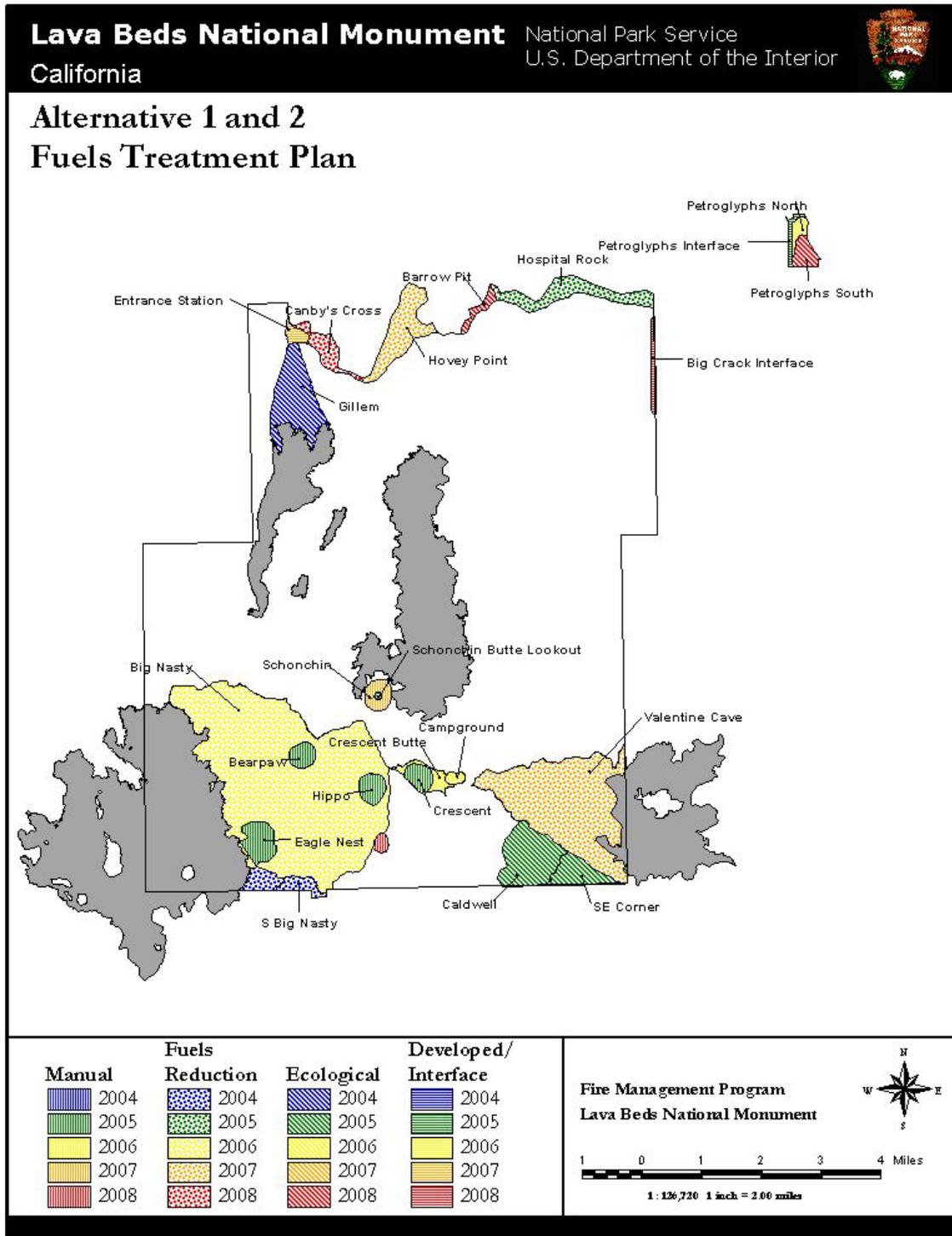


Figure 2- 2. Alternative 1 (No Action) – Continued Implementation of the 1992 Plan,
Proposed Treatment Areas.



2.4.2 Alternative 2 (Proposed Action) – Fire Regime Restoration Emphasis

This alternative meets the purpose and need by establishing a fire program that uses the same fire management strategies as Alternative 1 (wildland fire suppression, prescribed fire, and manual treatments), with the addition of Wildland Fire Use. The goals emphasized under this alternative are to:

- Restore and maintain natural fire regimes
- Reduce hazardous fuel accumulations near values at risk
- Reduce the likelihood of unwanted fires crossing jurisdictional boundaries
- Protect human life and property within and adjacent to the monument

Under this alternative, the FMP would be amended to manage the area within Lava Beds National Monument as two Fire Management Units (see Figure 2- 3); the Protection FMU and the Fire Use FMU.

The **Protection Unit** includes areas adjacent to the boundary of the monument, and the area encompassing the monument’s administrative facilities. In this FMU, most wildland fire ignitions would receive an immediate appropriate management suppression response commensurate with public and firefighter safety and the values at risk.

The **Fire Use Unit** includes the majority of the two wilderness areas interior to the Protection Unit. In this FMU, all fire management strategies are available for use, but with an emphasis on managing natural ignitions to restore and maintain natural fire regimes.

Within both Fire Management Units, prescribed fire and manual treatments would be implemented to reduce hazardous fuels, protect human life and property, and restore fire as an ecosystem process. The extent of treatment implementation could be modified depending on the amount of Wildland Fire Use activity. Table 2- 2 summarizes the treatment acres by treatment type and Figure 2- 4 shows the proposed treatment areas under this alternative. The fire and fuels treatments proposed under Alternative 1 and 2 are the same; however, the sizes and shapes of the FMUs differ slightly.

Table 2- 2. Alternative 2 - Summary of Treatment Acres by Treatment Type.

Alternative	Treatment Type	Acres Per Year					5- Year Total Acres	5- Year Average Acres
		2004	2005	2006	2007	2008		
2 (Proposed)	Prescribed Fire	914	1,152	5,288	2,372	356	10,082	2,016
	Manual	0	155	37	125	106	423	85

Figure 2- 3. Alternative 2 (Proposed Action) – Fire Regime Restoration Emphasis,
Fire Management Units.

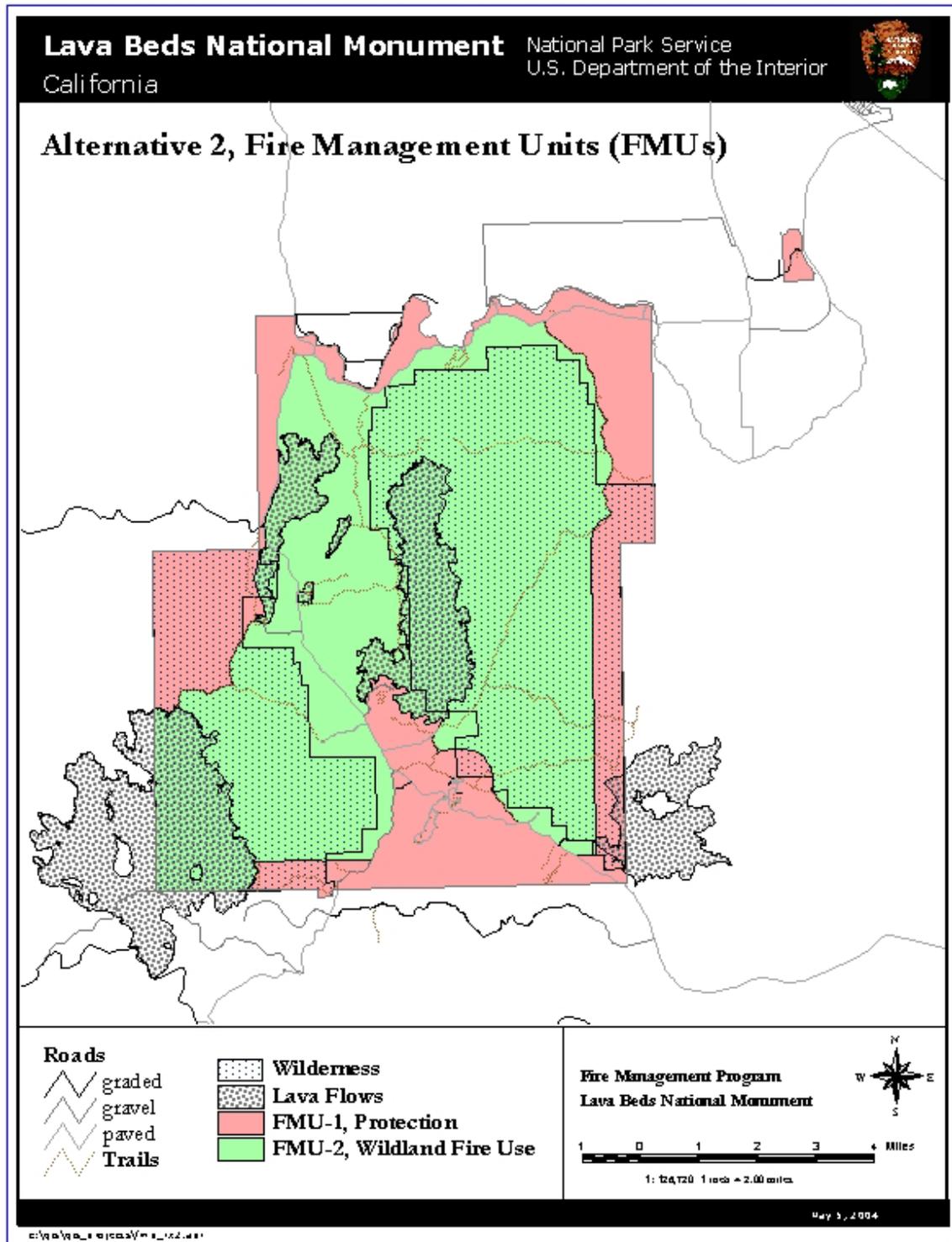
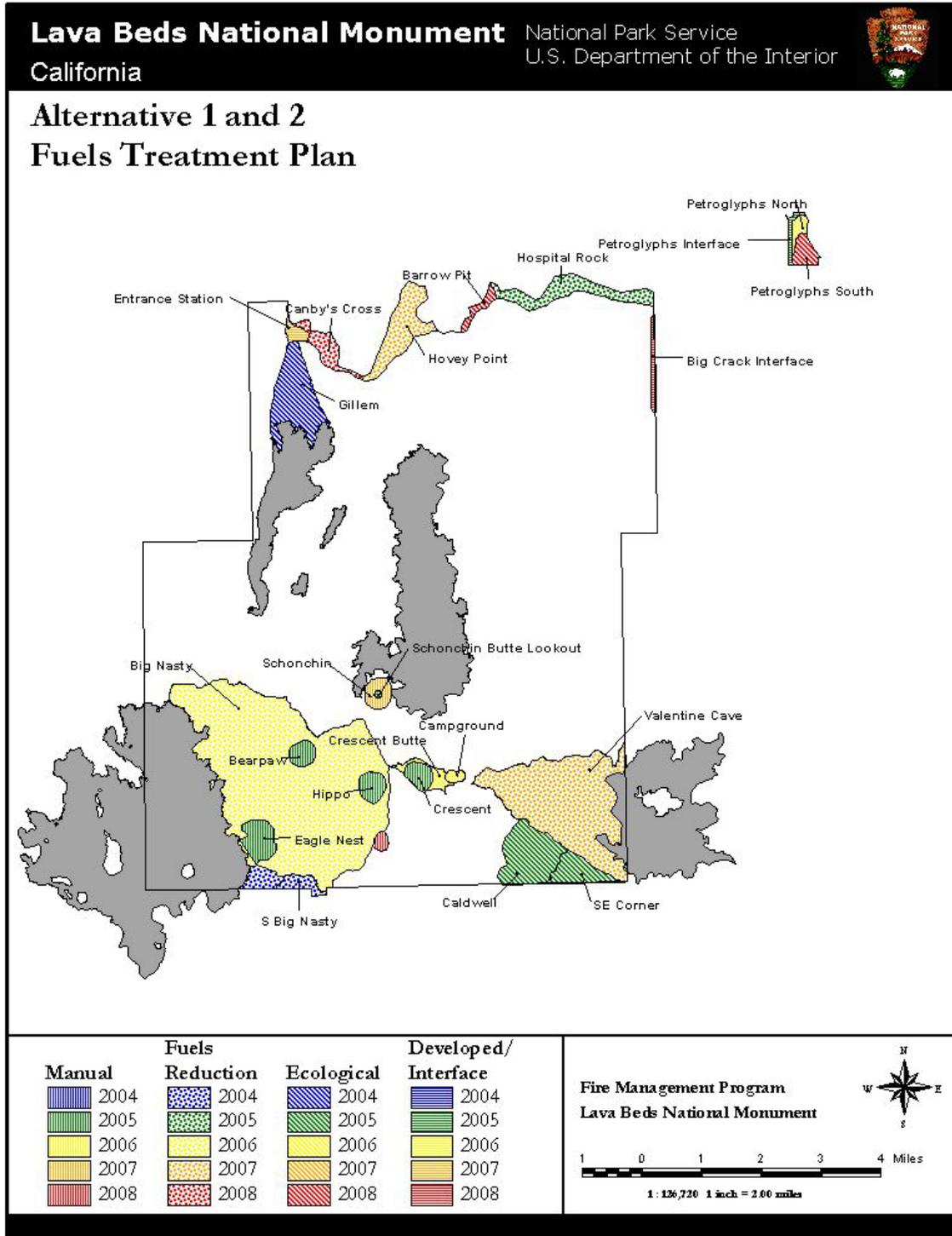


Figure 2- 4. Alternative 2 - (Proposed Action) Fire Regime Restoration Emphasis, Proposed Treatment Areas.



2.4.3 Alternative 3 – Fire Suppression Emphasis

This alternative meets the purpose and need by establishing a fire program that uses limited fire management strategies compared to Alternatives 1 and 2. The goals emphasized under this alternative are to:

- Reduce hazardous fuel accumulations near values at risk
- Reduce the likelihood of unwanted fires crossing jurisdictional boundaries
- Protect human life and property within and adjacent to the park

Under this alternative, the FMP would be amended to manage the area within Lava Beds National Monument as one Fire Management Unit (see Figure 2- 5); the Suppression FMU.

With this alternative, the FMP would be amended to require that all ignitions within the monument, regardless of the source, be suppressed with available resources. Prescribed fire and Wildland Fire Use strategies would NOT be employed.

Under this alternative, protecting human life and property, reducing the likelihood of unwanted fires, and removing hazardous fuels would be accomplished using manual treatments (e.g. chainsaws, manual grubbing, etc.) as a surrogate for managed fire. Unlike Alternatives 1 and 2, this alternative does not employ managed fire strategies to restore and maintain natural fire regimes.

Table 2- 3 summarizes the treatment acres by treatment type and Figure 2- 6 shows the proposed treatment areas under this alternative.

Table 2- 3. Alternative 3 - Summary of Treatment Acres by Treatment Type.

Alternative	Treatment Type	Acres Per Year					5- Year Total Acres	5- Year Average Acres
		2004	2005	2006	2007	2008		
3	Prescribed Fire	0	0	0	0	0	0	0
	Manual	0	155	37	125	106	423	85

Figure 2- 5. Alternative 3 - Fire Suppression Emphasis, Fire Management Units.

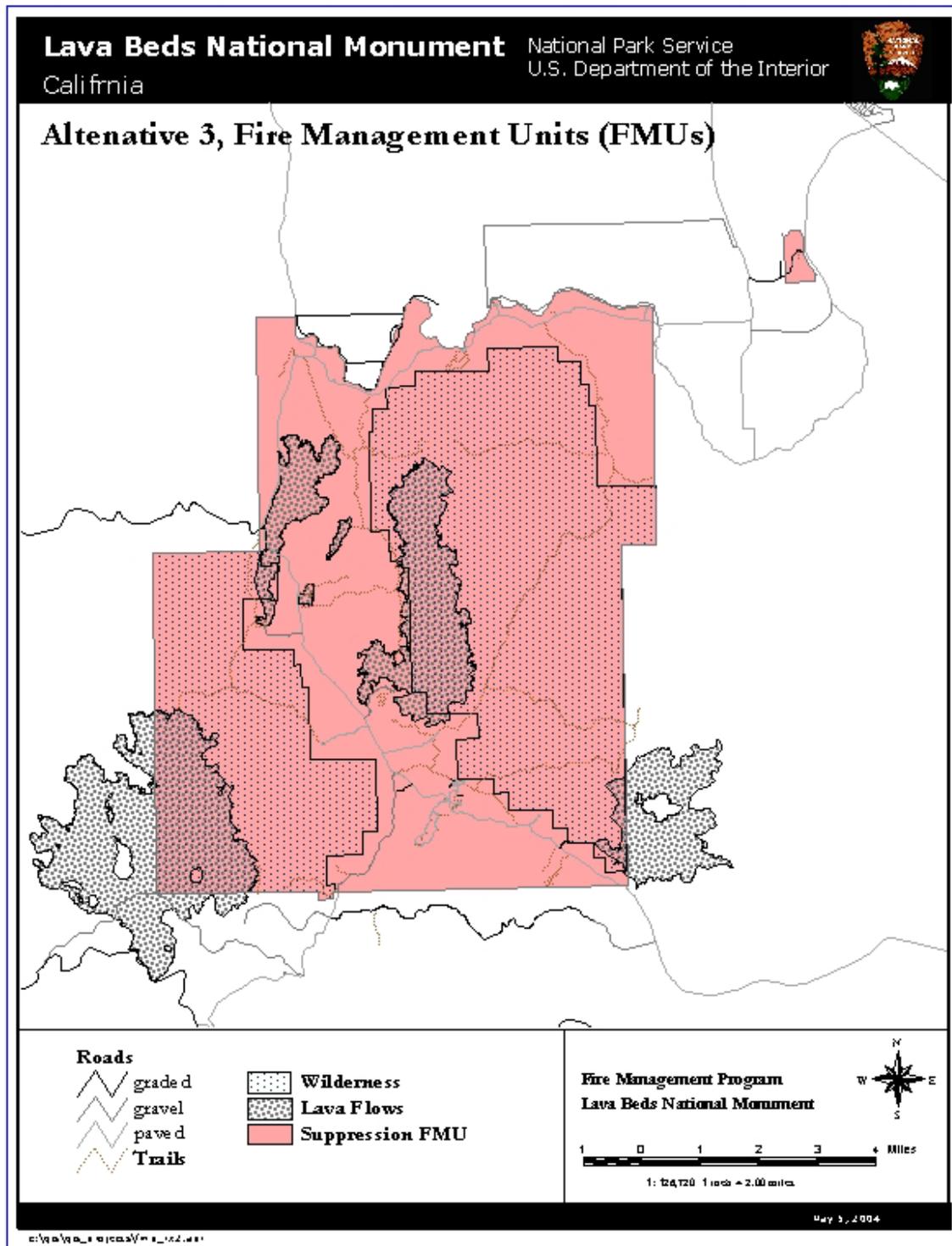
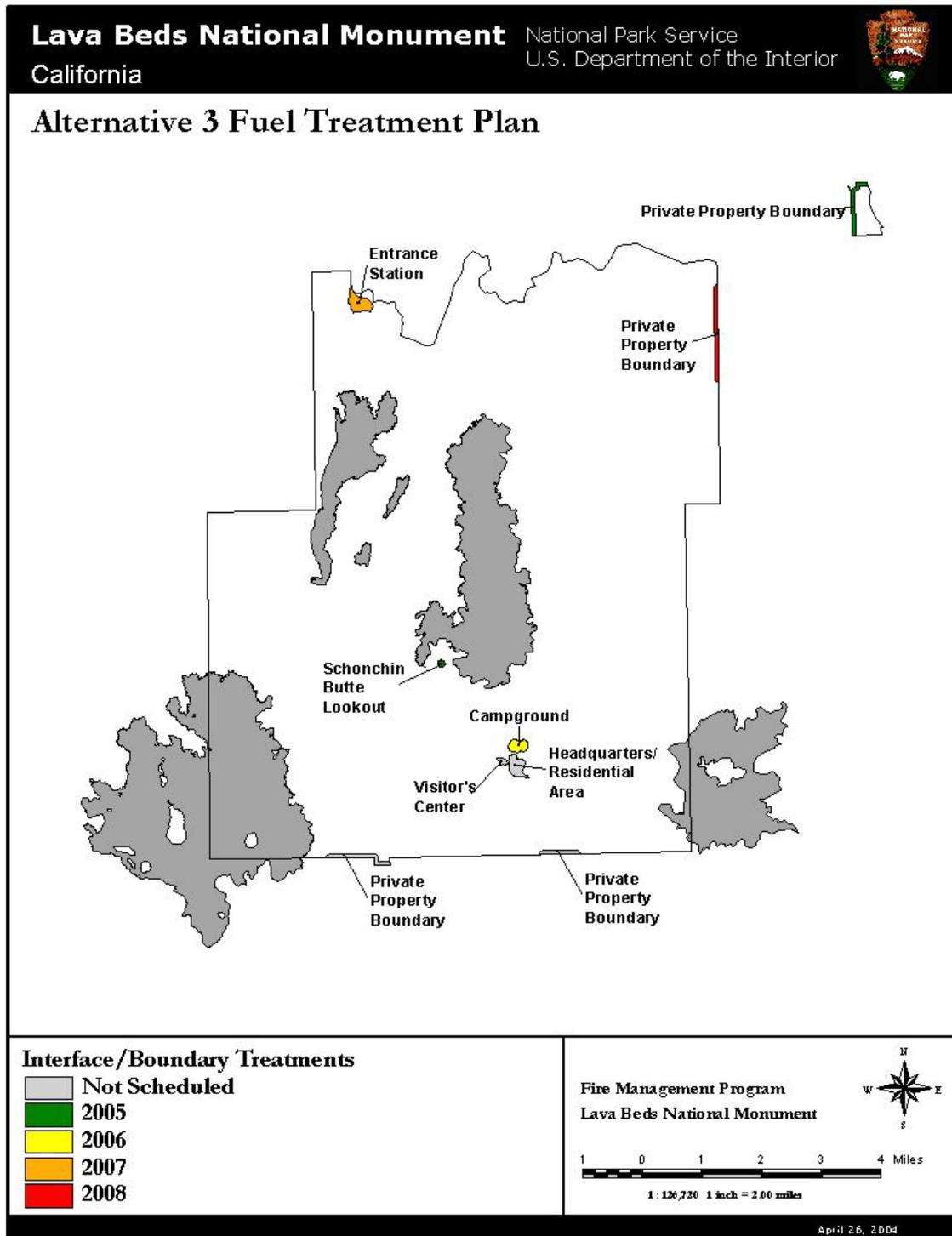


Figure 2- 6. Alternative 3 - Fire Suppression Emphasis, Proposed Treatment Areas.



2.4.4 Environmentally Preferred Alternative

The National Park Service is required to identify the environmentally preferred alternative(s) for any of its proposed projects. That alternative is the alternative that will promote the national environmental policy expressed in NEPA (Section 101 (b)). This includes alternatives that:

- 1) Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;
- 2) Ensure for all Americans safe, healthful, productive, and esthetically and culturally pleasing surroundings;
- 3) attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences;
- 4) preserve important historic, cultural, and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice;
- 5) achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities; and
- 6) Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

In essence, the environmentally preferred alternative would be the one(s) that “causes the least damage to the biological and physical environment; it also means the alternative which best protects, preserves, and enhances historic, cultural, and natural resources” (DOI, 2001).

In this case, Alternative 2 (Proposed Action) is the environmentally preferred alternative for Lava Beds National Monument since it meets goals 1, 2, 3, and 4 described above. Under this alternative, fire management activities would help restore natural fire regimes, including the influences on native vegetation function and structure. This alternative would reduce hazardous fuel loadings in the monument and help protect park resources and adjacent lands from the threat of future wildfires. Finally, Alternative 2 best protects and helps preserve the historic, cultural, and natural resources in the park for current and future generations. Alternative 1 meets goals 1- 4, to a lesser extent than the Proposed Action. Alternative 3 does not meet goals 3 and 4.

2.5 Impact Definitions

Table 2-4 depicts the impact definitions used in this Environmental Assessment. Significant impact thresholds for the various key resources were determined in light of compliance with existing state and federal laws, and with existing Lava Beds National Monument planning documents.

Table 2- 4. Impact Definitions for Lava Beds National Monument Fire Management Plan EA.

Key Resources	“Minor” Impact	“Significant” Impact
Human Health & Safety	Minor injuries to any worker; limited exposure to hazardous compounds or smoke particulates at concentrations below health- based levels	Serious injury to any worker or member of the public; exposure to hazardous compounds or smoke particulates at concentrations above health- based levels
Air Quality	Minimal to negligible air emissions and temporary smoke accumulation; temporary and limited smoke exposure to sensitive resources	Violation of state and Federal air quality standards; violation of Class I air quality standards; prolonged smoke exposure to sensitive receptors
Cultural Resources	No Adverse Effect to Historic Properties including archeological resources, historical structures, cultural landscapes, ethnographic resources and museum objects listed or eligible for listing on the National Register of Historic Places	Adverse Effect to Historic Properties including archeological resources, historical structures, cultural landscapes, ethnographic resources and museum objects listed or eligible for listing on the National Register of Historic Places
Soils & Water	Minor damage to or loss of the litter/humus layers that causes minor localized increases in soil loss from erosion; fire severe enough to cause minor harm to soil community; minor, temporary surface sterilization of soils that does not cause long term loss of soil productivity that would alter or destroy vegetation community; short- term and localized compaction of soils that does not prohibit re- vegetation; minor damage to or loss of the litter/humus layers that increases sedimentation on no more than 0.1% of a sub watershed	Damage to or loss of the litter/ humus layers that would increase soil loss from erosion on a substantial portion of the burn area; fire severe enough to damage soil community; substantial surface sterilization of soils that may cause long term loss of soil productivity and that may alter or destroy a portion of the vegetation community; long- term and widespread soil compaction that affects a large number of acres and prohibits re- vegetation; Damage to or loss of the litter/humus layers that increases sedimentation on greater than 0.1% of a sub watershed

Key Resources	“Minor” Impact	“Significant” Impact
Vegetation	Short- term changes in plant species composition and/or structure, consistent with expected successional pathways of a given plant community from a natural disturbance event; thinning of small diameter under story trees and shrubs	Violation of the Endangered Species Act of 1973; long- term changes in plant species composition, inconsistent with expected successional pathways of a given plant community; removal of numerous trees greater than 80 cm at breast height
Wildlife	Temporary displacement of localized individuals or groups of animals; isolated mortality of individuals not afforded special protection by state and/or federal law	Violation of the Endangered Species Act of 1973; mortality of species that jeopardize the resident population
Cave Resources	Temporary smoke exposure to sensitive resources (bats, cave structures); Removal of small amounts of vegetation around cave entrances that temporarily increases background levels of erosion and sedimentation and causes minor changes in airflow into and out of the cave	Permanent smoke damage to cave structures; Removal of vegetation around entrances that substantially increases erosion and sedimentation beyond background levels; Permanent damage to cave resources (natural and cultural) from excessive foam or retardant application; Permanent change in airflow into and out of the cave
Wilderness	Short- term and local impacts that conflict with wilderness values but are of limited duration and scope	Long- term and regional impacts that conflict with wilderness values or are of unlimited duration or scope
Visitor Use & Experience	Temporary displacement of visitors or closure of trails, and recreation areas during off- peak recreation use; temporary or short- term alteration of the vista, or temporary presence of equipment/structures in localized area; smoke accumulation during off- peak recreation use	Permanent closure of trails and recreation areas; conflict with peak recreation use; long- term change in scenic integrity of the vista; substantive smoke accumulation during peak recreation use
Socio- economics	Minimal to no short or long- term economic impact on local or regional economy (< 2%); proportionate impact on poor or minority communities	A change in local or regional economy greater than 2%; disproportionately high and adverse impact on poor or minority communities

2.6 Mitigation Measures

Every fire management project at Lava Beds National Monument will be monitored, and each of the mitigation measures listed below will be evaluated to determine 1) if it was implemented as stated, and 2) if it was effective at mitigating the impact to the resource it was designed to protect. Monitoring reports will become part of the permanent record of each fire incident or project.

The project coordinator (Incident Commander, Burn Boss, and Fire Management Officer) will be responsible for evaluating implementation measures. All evaluations of fire management projects will be done in a timely manner after project completion. Post project evaluations will be used to improve future fire management activities.

Mitigation measures are prescribed to prevent and/or mitigate adverse environmental impacts that may occur from fire management activities. The following mitigation measures are common to all three alternatives.

2.6.1 Fire Management Activities

- Whenever consistent with safe, effective suppression techniques, the use of natural or existing man-made barriers will be used as extensively as possible;
- Use of water is preferred for aerial drops within the monument;
- Fire retardant agents must be on an approved list for use by Federal agencies;
- Heavy earth-moving equipment such as tractors, graders, bulldozers or other tracked vehicles will generally not be used for fire suppression. The Superintendent can authorize the use of heavy earth-moving equipment in extreme circumstances in the face of loss of human life and/or property;
- When hand line construction is required, construction standards will be issued requiring the hand lines to be built with minimum impact. Fire control methods near cultural sites, especially the construction of control lines that expose mineral soil, will be developed in consultation with an archeological technical specialist to avoid adverse effects to cultural materials. All control lines will be rehabilitated. Erosion control methods will be used on slopes exceeding 10% where control line construction took place;
- All sites where improvements are made or obstructions are removed will be rehabilitated to pre-fire conditions, to the extent practicable;
- Educational/informational materials will be developed and distributed to the park visitor on what to expect during fire management activities including potential noise from chainsaws during line construction, smoke dispersion, safety, helicopter and airplane use, and information on where and when these activities would occur.

2.6.2 Cultural Resources

- Fire control methods near cultural sites, especially the construction of control lines that expose mineral soil, will be developed in consultation with an archeological technical specialist to avoid adverse effects to cultural materials;
- Prior to all prescribed fire and non-fire fuel treatments, project areas will be inventoried for cultural resources and strategies will be developed and implemented to negate or minimize any identified potential adverse effects;
- Prior to all wildfire and wildland fire use activities, cultural resources in affected areas will be identified and mitigation measures will be implemented to prevent adverse impacts;
- Fire retardant use will be prohibited in the vicinity of any historic structure, unless there is imminent threat from wildfire to the historic structure;

- A designated Cultural Resource representative will conduct an inspection and develop a plan to protect any existing or new cultural resources identified before and after prescribed fires;
- Cultural resource digital databases and GIS layers will be maintained in a current status and available on CDs during fire season to expedite the management decision making process;
- The Park Archeologist, Northern California Sub- cluster Fire Archeologist, or PGSO Fire Archeologist, if available, will be notified immediately in the event of wildfire or Wildland Fire Use (WFU) and will participate in the WFU go/no- go process;
- An archeological resource specialist and/or resource advisor is recommended if extended attack is required and the wildfire is in an archeologically sensitive area;
- When American Indian Cultural Sites are threatened by fire, or fire suppression activities then the affiliated American Indian Tribes will be notified;
- Identified historical structures, cultural landscapes, ethnographic and archeological sites determined eligible or listed on the National Register of Historic Places will be priorities in resource protection planning;
- All WFUs will include an archeological monitor as part of the incident management team if documented archeological resources are threatened or the fire is located in an archeologically sensitive area;
- An archeologist will participate in the planning and execution of rehabilitation efforts following wildfires and WFUs.

2.6.3 Soil and Water Resources

- Fire lines will be located outside of highly erosive areas, steep slopes, and other sensitive areas;
- Crews will implement minimum impact suppression techniques (MIST) to minimize and/or eliminate adverse soil impacts resulting from ground crew activities.

2.6.4 Vegetation and Wildlife

- No direct over flights of known bald eagle roost sites will be allowed below 1500 feet Above Ground Level (AGL) from November 1 to March 31 each year (LAFE Supt. Compendium, 2003);
- If threatened, endangered, or sensitive plant species are found in a treatment unit, a buffer surrounding the plants will be imposed that prohibits physical damage to the identified population. The assigned Resource Advisor will be consulted when determining the appropriate buffer;
- Park staff will clean fire management equipment prior to its use to prevent the spread of invasive weeds;
- Park staff will stage fire management operations away from known invasive weed infestations, and will construct fire lines away from known patches;
- Park staff will survey for invasive weeds in treatment units prior to ignition of prescribed fire.

2.6.5 Cave Resources

- Ignition will not take place in cave entrance collapses;
- Foams and retardants will not be used within 200 feet of known cave openings unless there is an imminent threat to human life or property;
- Fire suppression strategies will be sensitive to cave resource values, by not tying control lines into cave entrances unless they are being used as natural fuel breaks;
- Prior to all wildland fire and fire use activities, cave locations will be scouted and efforts made to avoid cave entrances;
- A Resource Advisor will be assigned to all fires in areas involving cave resources to mitigate potential impacts to maternal and hibernating bat colonies.

2.6.6 Wilderness Values

- Wildland fire operations within the Wilderness Area will adhere to the requirements of the Wilderness Act, NPS Management Policies, and the NPS Director’s Orders 18 and 41 Wilderness Preservation and Management;
- All fire management activities within the Wilderness Area will employ minimum actions and tools necessary based upon the Minimum Requirement and Minimum Tool Determination;
- All fire management activities within the Wilderness Area will follow established MIST implementation guidelines;
- All fire management activities within the Wilderness Area will follow established Rehabilitation Guidelines for Wilderness Fire Suppression Activities;
- A Resource Advisor will be made available to advise fire crews on all project design features and to monitor resource damage.

2.6.7 Visitor Use and Experience

- Fire management activities (excluding fire suppression) will not be conducted near developed areas and trails during holidays;
- When campsites or travel routes are closed during fire management activities, visitors will be rerouted to alternative travel routes or campsites.

2.7 Comparison of Alternatives

A comparison of the three alternatives by fire management strategy is shown below in Table 2- 5 and a comparison of the treatment acres and types are shown in Table 2- 6. Table 2- 7 summarizes how the three alternatives compare in response to the project needs and objectives and the impact topics.

Table 2- 5. Comparison of Fire Management Strategies by Alternative.

Alternative	Fire Management Strategy				
	Fire Suppression	Wildland Fire Use	Prescribed Fire	Manual Treatment	Fire Effects Monitoring
1 (No Action)	Yes	NO	Yes	Yes	Yes
2 (Proposed Action)	Yes	Yes	Yes	Yes	Yes
3	Yes	NO	NO	Yes	NO

Table 2- 6. Summary of Treatment Acres by Alternative and Treatment Type.

Alternative	Treatment Type	Acres Per Year					5- Year Total Acres	5- Year Average Acres
		2004	2005	2006	2007	2008		
1 (No Action)	Prescribed Fire	914	1,152	5,288	2,372	356	10,082	2,016
	Manual	0	155	37	125	106	423	85
2 (Proposed)	Prescribed Fire	914	1,152	5,288	2,372	356	10,082	2,016
	Manual	0	155	37	125	106	423	85
3	Prescribed Fire	0	0	0	0	0	0	0
	Manual	0	155	37	125	106	423	85

Table 2- 7. Summary of Alternative Responses to Project Needs, Objectives, and Impact Topics.

	Alternative 1 (No Action) Continue with 1992 Fire Management Plan	Alternative 2 (Proposed Action) Fire Regime Restoration Emphasis	Alternative 3 Fire Suppression Emphasis
Project Needs & Objectives			
Reduces hazardous fuel accumulations near values at risk	Yes, 10,505 acres would be treated over 5 years.	Yes, with the addition of wildland fire use > 10,505 acres would be treated over 5 years.	Yes, hazardous fuels would be reduced on 423 acres over 5 years.
Restores and maintains natural fire regimes	Yes, 10,082 acres would be treated over 5 years.	Yes, 10,082 acres would be treated over 5 years. Additional acres possible through managed natural ignitions.	Minimal to no acres restored because all fires are immediately suppressed.
Reduces the likelihood of unwanted fires crossing jurisdictional boundaries	Yes, fire management activities would create fuel breaks on 10,505 acres over 5 years.	Yes, fire management activities would create fuel breaks on 10,505 acres over 5 years and additional protection is possible with managed natural ignitions.	Yes, fire management activities would create fuel breaks on 423 acres over 5 years that are adjacent to private property.
Protects human life and property within and adjacent to the monument	Yes, fire management activities would provide protection of human life and property within and adjacent to the monument.	Yes, fire management activities would provide the greatest protection of human life and property within and adjacent to the monument.	Yes, fire management activities would provide the least protection of human life and property within and adjacent to the monument.
	Alternative 1 (No Action) Continue with 1992 Fire Management Plan	Alternative 2 (Proposed Action) Fire Regime Restoration Emphasis	Alternative 3 Fire Suppression Emphasis
Impact Topics			
Human Health and Safety	Human health and safety improved by reducing fire danger to the monument and adjacent lands; Minor exposure to smoke by workers and the public during prescribed fire and suppression activities. Potential for injury from thinning activities.	Human health and safety improved by reducing fire danger to the monument and adjacent lands; Minor exposure to smoke by workers and the public during prescribed fire, wildland fire use and suppression activities. Potential for injury from thinning activities.	Human health and safety improved by reducing fire danger to the monument and adjacent lands; Minor exposure to smoke by workers and the public during fire suppression activity. Potential for injury from thinning activities.
Air Quality	Minor and temporary effects from prescribed fires and slash pile burning; minor smoke impacts on sensitive wildlife receptors.	Minor and temporary effects from prescribed fires, wildland fire use and slash pile burning; minor smoke impacts on sensitive wildlife receptors.	Minor and temporary effects from slash pile burning; no impacts on sensitive wildlife receptors.
Cultural Resources	No adverse impacts to known cultural resources; impacts to unknown cultural resources are mitigated through pre-treatment inventories and mitigation. Use of MIST during fire suppression activities would prevent potential adverse impacts to unrecorded sites.	No adverse impacts to known cultural resources; impacts to unknown cultural resources are mitigated through pre-treatment inventories and mitigation. Use of MIST during fire suppression activities would prevent potential adverse impacts to unrecorded sites.	No adverse impacts to known cultural resources; Use of MIST during fire suppression activities would prevent potential adverse impacts to unrecorded sites.

Soils/Water	Minor short- term soil erosion and compaction impacts from manual thinning and prescribed fire activities; benefits to soil development and nitrification from prescribed fire.	Minor short- term soil erosion and compaction impacts from manual thinning and prescribed fire activities; benefits to soil development and soil nitrification from prescribed fire and wildland fire use.	Minor short- term soil erosion and compaction impacts from manual thinning activities.
Vegetation	Plant habitat and diversity improved; native plant and fire- tolerant species favored.	Plant habitat and diversity improved; native plant and fire- tolerant species favored.	Native plant habitat and diversity not measurably improved.
Wildlife	Thinning and prescribed fire activities would temporarily displace some wildlife species; isolated mortality of individuals likely; very minor short- term impact on sensitive species habitat; general wildlife habitat improved in the long- term with restoration of natural fire regimes and suppression of unwanted wildfires.	Thinning, prescribed fire, and wildland fire use activities would temporarily displace some wildlife species; isolated mortality of individuals likely; very minor short- term impact on sensitive species habitat; general wildlife habitat improved in the long- term with restoration of natural fire regimes and suppression of unwanted wildfires.	Thinning and fire suppression activities would temporarily displace some wildlife species; isolated mortality of individuals likely; very minor short- term impact on sensitive species habitat.
Cave Resources	Minor exposure to smoke by sensitive receptors (bats, cave structures) during prescribed fire and suppression activities.	Minor exposure to smoke by sensitive receptors (bats, cave structures) during prescribed fire, wildland fire use and suppression activities.	Minor exposure to smoke by sensitive receptors (bats, cave structures) during fire suppression activities.
Wilderness	Minor, local impacts to wilderness resources and values (noise- related).	Minor, local impacts to wilderness resources and values (noise- related).	No impact to wilderness resources and values.
Visitor Use and Experience	Minor and short- term impacts during manual thinning, prescribed fire and wildfire suppression activities (e.g. trail or road closures, presence of work crews in the vista).	Minor and short- term impacts during manual thinning, prescribed fire and wildfire suppression activities (e.g. trail or road closures, presence of work crews in the vista); wildland fire use would result in minor and longer term visual impacts from smoke emissions.	Minor and short- term impacts during manual thinning and wildfire suppression activities (e.g. trail or road closures, presence of work crews in the vista);
Socio- economics	Very minor effects on local and regional economy; no adverse impact to poor and/or minority populations.	Very minor effects on local and regional economy; no adverse impact to poor and/or minority populations.	Very minor effects on local and regional economy; no adverse impact to poor and/or minority populations.

Chapter 3 – Environmental Analysis

This chapter summarizes the existing environmental conditions and the probable environmental consequences (effects) of implementing the action and No Action alternatives. This chapter also provides the scientific and analytical basis for comparing the alternatives. The probable environmental effects are quantified where possible; where not possible, qualitative descriptions are provided.

This analysis summarizes the probable impacts in broad general terms and therefore is not project specific. Additional environmental compliance will be done prior to the implementation of each individual fire management activity (prescribed burn, fuel reduction project, pile burning, etc.) to identify site-specific concerns and necessary mitigations measures that are in addition to those listed in Section 2.6.

3.1 Human Health and Safety

3.1.1 Affected Environment

Lava Beds National Monument has a comprehensive fire management program dedicated to ensuring the safety of the public and monument employees. Numerous safety measures are followed to maintain the highest safety standards possible for monument visitors, employees, and residents, and landowners/residents living adjacent to the monument.

Monument personnel follow several safety standards and best management practices to minimize their exposure to hazardous equipment and conditions while working. Hazardous conditions include smoke, burning organic material, diurnal fluctuations in temperature and humidity, unsure footing on steep and rocky terrain, poisonous snakes and insects, and long work periods. Hazardous equipment includes aircraft, motorized vehicles, hand tools, chainsaws and water pumps. Employees regularly review the job hazards identified for each fire fighting position. The job hazard analysis includes a list of potential hazards for each task and provides the proper implementation techniques, personal protective gear, and hazard mitigation measures.

Monument personnel are informed of potential threats on a daily basis through a fire activity report. If wildland fires or wildland fire use pose an imminent threat to human health or safety, the Superintendent has the authority to close all or a portion of the monument, including trails and roads.

Public information and education pertaining to fire management is presented through normally scheduled activities throughout the year, as well as through focused activities when fires are in progress. Year round activities include distribution of handouts, brochures, and publications pertaining to the wildland fire program. Information on this program is also incorporated into visitor contacts, interpretive talks, and campfire programs.

During planned and un-planned fire activities, informational and educational actions are major components for ensuring that the public is appropriately informed of potential threats. During these periods, handouts specific to the on-going fire may be prepared and distributed to visitors entering the park, or at primary viewing areas. Areas of fire activity are clearly marked with signs at trail heads and along roadways. Visitors obtaining permits for backcountry use are notified of the exact location of fire activity by personnel. Also, nearby residents adjacent to the monument are notified if any fire poses a possible threat to cross outside monument boundaries. News releases are distributed to the media as directed by the Superintendent.

The monument also maintains a visitor evacuation plan for the campground, Cave Loop Road and headquarters area; and a spill response program to contain and remove contaminants, such as fire retardants, foams, and gasoline.

3.1.2 Environmental Consequences

Human health and safety impacts were qualitatively assessed through determination of activities, equipment and conditions that could result in injury, literature review of type and extent of injury caused by equipment and conditions, and in light of mitigation measures and best management practices.

3.1.2.1 Alternative 1 (No Action) – Continued Implementation of 1992 Plan

Under the No Action Alternative, impacts to human health and safety would be minor. Factors most likely to adversely impact public and fire-fighter health and safety include accidental spills, injuries from the use of fire-fighting equipment, smoke inhalation, and, in severe cases, injuries from wildland or prescribed fires.

Of chemicals used by fire management staff, accidental spills of fire retardants and foams are the most likely to adversely impact human health & safety. Fire retardants used in controlling or extinguishing fires contain about 85% water, 10% fertilizer, and 5% minor ingredients such as corrosion inhibitors and bactericides. Fire suppressant foams are more than 99% water. The remaining 1% contains surfactants, foaming agents, corrosion inhibitors, and dispersants. These qualified and approved wildland fire chemicals have been tested and meet specific requirements with regard to mammalian toxicity as determined by acute oral and dermal toxicity testing as well as skin and eye irritation tests (USDA, 2001). However, they are strong detergents, and can be extremely drying to skin. All currently approved foam concentrates are irritating to the eyes as well. Application of a topical cream or lotion can alleviate the effects of a retardant, and protective goggles can prevent any injury to the eyes when using foams.

Fuel break development and hazard fuels reduction practices pose safety threats to firefighters. Injuries can occur from the use of equipment as well as from traveling overland to targeted areas for fire-fighting or fire prevention efforts. While each of the crew is trained in the use of fire-fighting equipment, accidental injuries may occur from time to time. Fire management operations apply risk management procedures to minimize and mitigate risks to an acceptable level of residual risk, thus maximizing the safety of wildland firefighters.

Smoke inhalation by firefighting crews can also pose a threat to human health & safety. Smoke from wildland fires is composed of hundreds of chemicals in gaseous, liquid, and solid forms. The chief inhalation hazard appears to be carbon monoxide (CO), aldehydes, respirable particulate matter with a median diameter of 2.5 micrometers (PM_{2.5}), and total suspended particulate (TSP). Adverse health effects of smoke exposure begin with acute, instantaneous eye and respiratory irritation and shortness of breath, but can develop into headaches, dizziness, and nausea lasting up to several hours. Based on a recent study of firefighter smoke exposure, most smoke exposures were not considered hazardous, but a small percentage routinely exceeded recommended exposure limits for carbon monoxide and respiratory irritants (USDA, 2000a).

Use restrictions applied to areas of prescribed fire or wildland fires would minimize or eliminate human health & safety concerns resulting from smoke exposure and fire injuries. Restrictions during times of high fire danger would prevent accidental ignitions from general public activities, like campfires, and would indirectly benefit human health and safety.

3.1.2.2 Alternative 2 (Proposed Action) – Fire Regime Restoration Emphasis

The general impacts to human health and safety under the Proposed Action would be similar to those described in the No Action Alternative. In addition, the inclusion of wildland fire use would indirectly benefit human health and safety by expediting the restoration of natural fire regimes to the plant communities in Lava Beds National Monument, thus reducing the potential for stand replacement fires that could impact developed areas.

3.1.2.3 Alternative 3 – Fire Suppression Emphasis

The general impacts to human health & safety for Alternative 3 would be similar to those described in the No Action Alternative but to a lesser degree because fewer prescribed fire activities would occur under this alternative in the short-term. Over the long-term, the exclusion of wildland fire use and prescribed fire could indirectly impact human health & safety since unnatural fuels accumulation in some areas would be delayed, thus potentially increasing the risk of a catastrophic or stand replacement fires in or near developed areas.

3.2 Air Quality

3.2.1 Affected Environment

Air is considered a natural resource in all NPS units and many park values and resources are dependent on good air quality. The Federal Clean Air Act (CAA), amended in 1990, was enacted to preserve, protect, and enhance air quality in regions of the United States, which are of special national or regional natural, recreational, scenic or historic value. The CAA identified a classification scheme to facilitate the prevention of significant deterioration (PSD) of air quality.

Lava Beds is a Class I air shed. Class I areas receive the highest degree of protection with only a small amount of certain kinds of additional air pollution allowed. Mandatory Class I areas were designated by Congress and include national wilderness areas over 5,000 acres. Lava Beds falls into this category. The CAA declares a “National Visibility Goal” to prevent and remedy visibility impairment in Mandatory Class I areas caused by human air pollution. Visibility refers to the clarity of the atmosphere and is typically measured as the distance one can see at a particular location and time. The absorption and scattering of light by both gasses and particles in the atmosphere restricts visibility. Natural factors which contribute to decrease visibility include fog, precipitation, blowing dust and snow, and relative humidity above 70%. Human activities that reduce visibility include the combustion of fossil fuels which transforms emissions into tiny visibility-reducing particles termed “aerosols”. The CAA has identified national ambient air quality standards (NAAQS) to protect public health and welfare. NAAQS have been set for six pollutants: particulate matter less than 10 microns (PM₁₀), carbon monoxide, nitrogen oxide, sulfur dioxide, ozone, and lead. These pollutants are called “criteria pollutants”, because the standards satisfy criteria specified in the CAA. The main air pollutants of concern at Lava Beds are ozone, sulfur dioxide, PM_{2.5} and PM₁₀ (DOI, 2004a).

Air quality monitoring and pollution control is subject to regulations of the California Environmental Protection Agency Air Resources Board (ARB), which has established 35 Air Pollution Control Districts or Air Quality Management Districts (air districts) within the state. Each of these air districts is required by law to implement a district-wide smoke management program (CEPA 2004b).

Lava Beds National Monument is located in the Siskiyou and Modoc air districts of the Northeast Plateau Air Basin. The Basin currently meets federal and state air quality standards with the exception of

particulate matter less than 10 microns (CEPA 2004a). Major sources of PM₁₀ in the area include wood burning stoves from local sources, seasonal prescribed and natural fire occurrence, and agricultural burning and field preparation. PM₁₀ monitoring started in 1994.

The air quality related values of Lava Beds NM are those resources that are potentially sensitive to air pollution and include visibility, soils, vegetation, and wildlife. Visibility is a very sensitive air quality related value in Lava Beds. Although visibility in the monument is still superior to that in many parts of the country, visibility in the monument is often impaired by light-scattering pollutants (haze), particularly from agricultural burning and wood stove emissions. The U.S. Environmental Protection Agency's Regional Haze regulations require States to establish goals for each Class I air quality area to improve visibility on the haziest days and ensure no degradation occurs on the clearest days. As part of the Interagency Monitoring of Protected Visual Environments (IMPROVE) network, visibility in Lava Beds has been monitored using an aerosol sampler (2000- present) and an automatic 35mm camera (1983- 1991).

The IMPROVE sampler measures concentrations in the PM_{2.5} range for sulfate, nitrate, organics, elemental carbon and soil. In addition to these parameters, key trace elements, such as selenium, lead, arsenic, vanadium and nickel are measured. These trace elements can provide information on the sources of the primary groups of particles. An analysis of 1990- 1999 data from two nearby parks with long-term data (Crater Lake NP and Lassen Volcanic NP) indicates that visibility in the area is improving on the clearest days and degrading on the haziest days.

Monitoring of air quality indicators is done throughout the year through cooperative agreements with the California Environmental Protection Agency Air Resources Board and an IMPROVE station installed by the University of California, Davis Crocker Nuclear Lab Air Quality Group.

Several plant species that occur at Lava Beds National Monument, including *Pinus jeffreyi* (Jeffrey pine), *Pinus ponderosa* (ponderosa pine), and *Populus tremuloides* (quaking aspen) are known to be sensitive to ozone. Ozone has been monitored with passive samplers from 1995- present. Ozone concentrations appear to be among the lower values recorded for California parks. However, trend data from 1993- 2002 in nearby Lassen Volcanic NP indicate that ozone is increasing in some areas of northern California (Sullivan et al. 2001).

For prescribed fires, there are three principle strategies to manage smoke and reduce air quality effects. They include:

1. Avoidance - This strategy relies on monitoring meteorological conditions when scheduling prescribed fires to prevent smoke from drifting into sensitive receptors, or suspending burning until favorable weather (wind) conditions;
2. Dilution - This strategy ensures proper smoke dispersion in smoke-sensitive areas by controlling the rate of smoke emissions or scheduling prescribed fires when weather systems are unstable, not under conditions when a stable high-pressure area is forming with an associated subsidence inversion. An inversion would trap smoke near the ground; and
3. Emission Reduction - This strategy utilizes techniques to minimize the smoke output per unit area treated. Smoke emission is affected by the number of acres burned at one time, pre-burn fuel loadings, fuel consumption, and the emission factor. Reducing the number of acres that are burned at one time would reduce the amount of emissions generated by that burn. Reducing the fuel before-hand reduces the amount of fuel available. Prescribed burning when fuel moistures are high can reduce fuel consumption. Emission factors can be reduced by pile burning or by using certain firing techniques such as mass ignition.

California's Smoke Management Program addresses potentially harmful smoke impacts from agricultural, forest and range land management burning operations (CEPA 2004b). Established guidelines provide the

framework for State and local air district regulators to conduct the program. Elements of the program include: registering and permitting of agricultural and prescribed burns; meteorological and smoke management forecasting; daily burn authorization; and enforcement. Prescribed burning within the monument is subject to the following smoke management guidelines:

Before obtaining air district permission to burn, a burner must complete the following planning steps: 1) Register their burn with the air district; 2) Obtain an air district and/or fire agency burn permit; 3) Submit a smoke management plan (SMP) to the air district; and 4) Obtain air district approval of the SMP. The SMP specifies the “smoke prescription,” which is a set of air quality, meteorological, and fuel conditions needed before burn ignition may be allowed.

After the air district approves all the burn planning requirements, including the permit and smoke management plan, the burner may begin making the final preparations to carry out the burn. This includes putting into place the resources needed to conduct the burn, notifying the public about the planned timing and specifics of the burn, and obtaining a final air district authorization to burn. The burner may contact the air district up to 96 hours prior to the desired burn time to obtain ARB or air district forecasts of meteorology and air quality needed to safely conduct the burn. The burner will continue to work with the air district and the ARB until the day of the burn to update the forecast information. Air district authorization to conduct a prescribed burn is provided to the burner no more than 24 hours prior to the burn.

The individual granted authority to burn (burn manager) is responsible for assuring that all conditions in the SMP and burn permit are met throughout the burn. Once the fire has been ignited, burners must make all reasonable efforts to assure the burn stays within its smoke plan prescription. If a burn goes out of its prescription, or adverse smoke impacts are observed, the burn manager will implement smoke mitigation measures as described in the SMP (CEPA 2004c).

3.2.2 Environmental Consequences

Air quality impacts were qualitatively assessed upon review of National Park Service best management practices to reduce air emissions, California Air Resources Board smoke management program, and the extent of proposed prescribed fire activities under all alternatives.

3.2.2.1 Alternative 1 (No Action) – Continued Implementation of 1992 Plan

Under the No Action Alternative, approximately 10,082 acres would be treated using prescribed fire over a 5-year period (2,016 acres on average annually). Prescribed fire could cause air quality impacts on certain days. State and local smoke management guidelines as discussed above would be followed. Only a limited number of acres are planned for prescribed burning each year compared to other areas in the Northeast Plateau Air Basin. If weather conditions changed unexpectedly during a prescribed fire and there was a potential for violating air quality standards or for adverse smoke impacts on sensitive receptors, the burn manager would implement a contingency plan, including the option for immediate suppression.

Fires designated as wildfires and on which suppression strategies are employed, are exempt from air quality regulations. In addition to complying with the ARB smoke management guidelines, monument staff would also follow the decision tree of the Fire Management Plan to guide decisions about effects of current fires and whether new ignitions should be classified as management fires or wildfires. There would not be any significant air quality impacts with the use of mitigation measures and adherence to state burning instructions, and in light of the limited number of acres to be burned each year.

3.2.2.2 Alternative 2 (Proposed Action) – Fire Regime Restoration Emphasis

The general impact to air quality under the Proposed Action would be similar to those described in the No Action Alternative. The same number of acres is proposed for prescribed fire treatment. In addition, the inclusion of wildland fire use could increase the amount of smoke emissions generated in the short-term.

Wildland fire use generally occurs over longer periods of time than prescribed fires and is characterized by periods of lesser or greater smoke emissions depending on fuel consumption and rate of spread. Wildland fire use would generally cause minor degradation in air quality or visibility except for short periods. If the impact of smoke does become significant, several actions may be taken: additional wildland fires may be classified as wildfires and suppressed; the current fire(s) may be suppressed; or the current fire(s) may be allowed to continue with smoke warnings posted for visitors and daily re-evaluations made.

3.2.2.3 Alternative 3 – Fire Suppression Emphasis

The general impact to air quality under Alternative 3 is less than for the No Action and Proposed Action Alternatives. No prescribed fire treatments are proposed, so smoke emissions would be limited to pile burning over less than 423 acres of manual fuel treatments.

However, the delay in restoring natural fire regimes to the monument would increase the likelihood of the monument experiencing large, intense wildfires that emit huge volumes of smoke.

3.2.2.4 Conclusion

Both the No Action and Proposed Action Alternative could influence smoke emissions depending on the burning conditions and desired fire behavior parameters. These impacts can be mitigated through proper implementation of established smoke management guidelines. Therefore, the implementation of any of the alternatives would not impair air quality resources or values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of the monument, (2) key to the natural or cultural integrity of the monument or opportunities for enjoyment of the monument, and (3) identified as a goal in the monument's general management plan or other National Park Service planning documents.

3.3 Cultural Resources

Federal land management agencies are required to consider the effects proposed actions may have on properties listed in, or eligible for inclusion in, the National Register of Historic Places (i.e., Historic Properties), and allow the Advisory Council on Historic Preservation a reasonable opportunity to comment on proposed actions. Agencies are required to consult with Federal, state, local, and tribal governments/organizations, identify historic properties, assess adverse effects to historic properties, and negate, minimize, or mitigate adverse effects to historic properties while engaged in any Federal or federally assisted undertaking (36 CFR Part 800). Requirements for proper management of museum objects are defined in 36 CFR 79.

3.3.1 Affected Environment

Lava Beds National Monument contains a diverse and valued suite of cultural resources within its boundaries including archeological resources, ethnographic resources, historic-period structures, and

cultural landscapes. On March 21, 1991, the Modoc Lava Beds Archeological District was entered in the National Register of Historic Places. The Archeological District includes all lands of the monument, except Petroglyph Point, which is already listed on the National Register of Historic Places as an archeological site. The Archeological District also extends onto some U.S. Fish and Wildlife Service lands to the north. The District resources include historic sites from the Modoc War of 1872-1873 and archeological sites that reflect over 7000 years of occupation including the more recent occupation by the Modoc Indians.

Archeological resources “are the remains of past human activity and records documenting the scientific analysis of these remains.” To date, a total of 434 archeological sites are documented at Lava Beds. These include rock shelters, campsites, resource procurement sites, lithic reduction sites, spiritual “Vision Quest” sites, burial and cremation sites, habitation sites, Modoc War fortifications, and rock art. Three archeological settlement zones have been identified in the monument. These include the lakeshore zone, ice cave zone, and the intermediate zone. The lakeshore zone located in the northern section of the monument, is the most archeologically sensitive consisting of the primary habitation zone prehistorically. The ice cave zone is also archeologically sensitive since seasonal habitation occurred in the vicinity of available water. The remainder of the park, or the intermediate zone, is less sensitive and the archeology reflects prehistoric foraging behavior. However, Gillem’s Bluff is also a sensitive area since there are several lithic scatters related to hunting activities present. In addition to the Lava Beds Archeological District there are five sites on the National Register of Historic Places, which includes Hospital Rock, Captain Jack’s Stronghold, Fern Cave, Petroglyph Point, and Thomas Wright Battlefield. Currently, about 6840 acres, or approximately 15% of the monument has been surveyed for archeological resources and it is estimated that hundreds, if not thousands of additional sites remain unrecorded. The monument recently completed a cultural resources overview that provides in- depth discussion of the park’s archeological resources (White et. al. 2001).

Ethnographic resources “are basic expressions of human culture and the basis for continuity of cultural systems” and encompasses both the tangible (native languages, subsistence activities) and intangible (oral traditions, religious beliefs). Lava Beds National Monument lies within the traditional Modoc tribal territory. The Modoc inhabited an area extending from Mount Shasta east to Goose Lake and north into present day Oregon. Ethnographic literature and consultations with local Native Americans, primarily the Modoc Indians and Klamath Tribe, suggest that numerous ethnographic sites exist within the monument. The Modoc people have identified a spiritual tie to these lands, especially to Fern Cave (NPS 2001). The monument is currently completing a cultural resources overview that will provide in- depth discussion of the park’s ethnographic resources (White et. al. draft 2004).

Structures “are material assemblies that extend the limits of human capacity,” and comprise such diverse objects as buildings, bridges, vehicles, monuments, vessels, fences, and canals. Lava Beds National Monument has 26 classified structures listed. These consist of Modoc War fortifications, and historical structures associated with National Park Service rustic architectural design and administrative history. The Superintendents residence #40, garage/shop, service station, Indian Well pump house, Schonchin Butte Fire Lookout, Gillem’s Camp/Cemetery, Hospital Rock, Captain Jack’s Stronghold, and 18 Civilian Conservation Corp picnic tables are included on the list of Classified Structures (LCS) (NPS 1999).

Cultural landscapes “are settings we have created in the natural world.” They are intertwined patterns of natural and constructed features that represent human manipulation and adaptation of the land. Currently Lava Beds does not have a Cultural Landscape Plan, although a Level I Cultural Landscape Inventory (CLI) was completed in 1998. The CLI states “Lava Beds National Monument contains five cultural landscapes that are listed, eligible, or potentially eligible for the National Register of Historic Places (NRHP).” The three highest priority landscapes are the Modoc Lava Beds Archaeological District, the Thomas- Wright Battle Site, and the Civilian Conservation Corps facilities construction (NPS 1999).

Fire can directly affect cultural resources. Examples include burning wooden structures and features, melting glass, spalling of rock art, and obsidian hydration rind elimination. Wooden structures and debris

will burn under most fire conditions, while glass, metal, and ceramics are generally only damaged in fires of a fairly high intensity or duration (Haecker 2001). Obsidian hydration rinds are damaged by temperatures exceeding 500° F (Bennett and Kunzman 1985) and may be affected at temperatures as low as 150° F if exposed for an extended period of time (Deal 2001). Duration of heating is less well understood, but in general, the longer a resource is exposed to heat, the greater the likelihood of damage. Fire can completely consume artifacts and features, or alter artifact and feature attributes impacting important research (e.g., obsidian hydration rinds, residues on pottery, bone burning), traditional (e.g., Native American spiritual sites) or other values.

Archeological materials most likely to be found within the monument include flaked-stone artifacts. Low intensity burns generally will not cause adverse impact on these cultural materials. However, moderate- to-high intensity fires could cause cracking or breakage.

3.3.2 Environmental Consequences

Cultural resource impacts were qualitatively assessed through a determination of the potential for adverse effects to cultural resources relative to fire management activities and mitigation measures to be employed during those activities (see Section 2.6.2).

3.3.2.1 Alternative 1 (No Action) – Continued Implementation of 1992 Plan

Operational effects to cultural resources are most likely to occur as a result of fire management actions associated with fire suppression tactics or manual fuel reduction projects. These actions include equipment and personnel staging, construction of fire lines, thinning of vegetation, use of fire retardants, and post-burn mop-up and rehabilitation. Strategies employed by fire management operations vary, as does the potential impact on cultural resources. Fire line construction can range from the use of equipment to hand crew lines, or burning from a wet line to minimize impact. Severe impacts from operational activities have occurred during wildfires. This is due primarily to the fact that such actions were often carried out with little or no pre-planning and without consultation with a cultural resource specialist.

The potential for damage to cultural resources is highest from tactics implemented during suppression, especially with undiscovered archaeological resources. Ground disturbance by fire crews can displace artifacts and/or they can be destroyed by use of hand tools or heavy equipment. However, the use of minimum impact suppression tactics (MIST) should lessen the chances of negative impacts. Fire retardants can stain and/or corrode historic structures. Currently, use of fire retardants is prohibited in the vicinity of historic structures. Fire suppression activity in the vicinity of a historic or archeological site should receive guidance from the monument Historian or a designated Resource Advisor.

Fuel management projects can potentially affect cultural resources both indirectly and directly. Fire can directly damage artifacts and feature through combustion and heat related affects to attributes of artifacts or features. Actions taken to control or limit the wildfire such as construction of control lines can expose, redistribute, and potentially damage archeological materials. Indirect affects from fire include increased erosion and loss of vegetation for varying periods of time.

Impacts under the no action alternative have the potential to adversely impact cultural resources. Identification of cultural resources, assessment of potential adverse impacts, and development of management actions to minimize, negate, or mitigate identified adverse impacts will be completed prior to implementation of all planned fire management projects (see Section 2.6.5). Management strategies will be reviewed by NPS regional staff or the State Historic Preservation Officer ensuring planned projects are in compliance with the National Historic Preservation Act (NHPA). Implementation of planned fire management projects for 10,082 acres will reduce the overall potential for catastrophic wildfire that could

severely impact cultural resources. Additionally, mitigation measures defined in Section 2.6.2 will ensure impacts to cultural resources during wildfires are minimized.

3.3.2.2 Alternative 2 (Proposed Action) – Fire Regime Restoration Emphasis

The general impact to cultural resources under the Proposed Action would be similar to those described in the No Action Alternative. The same number of acres is proposed for both prescribed fire and manual fuel treatments. The inclusion of wildland fire use for resource benefits would increase the amount of unrecorded sites exposed to low and moderate- intensity fire.

3.3.2.3 Alternative 3 – Fire Suppression Emphasis

The general impact to cultural resources under Alternative 3 is less than for the No Action and Proposed Action Alternatives. A total of 423 acres are proposed for manual treatments over 5 years, minimizing the amount of direct and indirect affects to cultural resources from fuel treatments. However, this alternative's emphasis on putting fires out after they have started rather than on preventing unwanted fires, increases the chances of a wildfire escaping initial attack efforts and becoming a large, cultural-resource- damaging fire over the long- term.

The general impact to cultural resources under Alternative 3 is less than for the No Action and Proposed Action Alternatives. A total of 423 acres are proposed for manual treatments over 5 years, minimizing the amount of direct and indirect affects to cultural resources from fuel treatments. However, this alternative's emphasis on putting fires out after they have started increases the risks of high- intensity wildfires occurring and damaging cultural resources.

3.3.2.4 Conclusion

All three alternatives could adversely impact unrecorded cultural resource sites depending on incident-specific fire behavior and associated fire suppression tactics. These impacts can be mitigated through proper implementation of minimum impact suppression guidelines and the cultural resource protection-specific mitigation outlined in Section 2.6 *Mitigation Measures*. Therefore, the implementation of any of the alternatives would not impair cultural resources or values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of the monument, (2) key to the natural or cultural integrity of the monument or opportunities for enjoyment of the monument, and (3) identified as a goal in the monument's general management plan or other National Park Service planning documents.

3.4 Soil and Water Resources

3.4.1 Affected Environment

Lava Beds is located in a semi- desert ecosystem. Annual rainfall for the park averages 15.4 inches as measured over the last 57 years at the Lava Beds National Monument headquarters office (Weather data, LABE Resource Office, 1947- 2004).

There are no streams, rivers, or lakes in Lava Beds. The only permanent water sources are found within approximately twenty ice caves. The ice resources within these caves are usually located well beyond the entrance of the cave and found in the dark zone of the cave. Many of these ice cave resources are used by wildlife as a permanent water resource. Ephemeral water sources are also found throughout the park in lava rock pockets that collect rainwater and snowmelt. These water sources are usually very small in size

but are also visited heavily by wildlife during certain periods of the year. Many caves also contain ephemeral ice formations and short-term water resources that are present during winter and spring. Climatic influences affect ice cave development and ice level fluctuation. Monitoring has been conducted on ice level fluctuation over time. Data from this project is correlated with climate data to better understand how ice caves are affected by changes in climate.

Due to the lack of surface water in the monument, water quality monitoring at Lava Beds has been limited to ice caves and park wells. In 1999, a baseline water quality analysis was conducted on ice caves that included measurements on pH, alkalinity, dissolved oxygen, ammonia nitrogen, free carbon dioxide, nitrite nitrogen, hardness and chloride (Cannon, 1999). Since 2002, the USGS has been monitoring ground water levels at Lava Beds. This project has been in operation to determine water sources and detect the array of ground water level fluctuations. Since this project was started, minor ground water level reductions have been documented along with no changes.

In 1983, a soil survey was completed for Lava Beds National Monument by the Modoc National Forest. Results from this survey confirmed 29 soil types within the monument. Two of the most common soil types within the park include searles-gwin complex and bakeoven association with the top soil horizon consisting of gravelly sandy loam to very cobbly loam. These soil types make up a large central area of the park and represent 20 percent of the monument (USDA, 1983). Lava flows occupy 7 percent of the monument.

Relatively well-developed soils in the northern section of the monument support the bunchgrass-sagebrush plant community, which is dominated by fire-tolerant grasses and shrubby sagebrush. More poorly-developed soils containing a great deal of volcanic pumice underlie the juniper-sagebrush community located throughout the mid-elevations.

3.4.2 Environmental Consequences

Soil impacts were qualitatively assessed using soil characteristics, literature reviews, and proposed mitigation measures.

3.4.2.1 Alternative 1 (No Action) – Continued Implementation of 1992 Plan

Implementation of the current Fire Management Plan would have minor effects on soils (soil erosion and compaction). The low fire intensities from prescribed burns would not significantly increase soil erosion since most of the targeted areas are low gradient and contain very coarse-textured soils. Direct soil impacts are more likely to occur from ground crew activities during fire suppression activities. In particular, the creation of fire lines and removal of vegetation in high gradient areas could result in soil erosion. The use of minimum impact suppression tactics (MIST) fire suppression guidelines outlined would minimize and/or eliminate any adverse soil impacts resulting from ground crew activities.

Prescribed fire would release nutrients into the soil and the fertilization effects of ash would provide an important source of nutrition for vegetation in the area. In addition to increasing nitrification of the soils and increasing minerals and salt amounts in the soil, the ash and charcoal residue resulting from incomplete combustion would aid in soil buildup and soil enrichment by being added as organic matter to the soil profile. The added material works in combination with dead and dying root systems to make the soil more porous, better able to retain water, and less compact while increasing needed sites and surface areas for essential microorganisms, mycorrhizae, and roots (Vogl, 1979; Wright and Bailey, 1980).

High temperatures resulting from pile burning to remove downed woody debris can also result in localized soil impacts underneath the pile. Soil organic matter can be removed or destructively altered, nutrients volatilized, water capacity decreased, and living plants and microorganisms killed (Brown et al., 2001).

3.4.2.2 Alternative 2 (Proposed Action) – Fire Regime Restoration Emphasis

Soil impacts under the Proposed Action would be similar to those described under the No Action Alternative. In addition, the inclusion of wildland fire use would increase the number of acres in the park whose soils would benefit from low and moderate severity fires.

3.4.2.3 Alternative 3 – Fire Suppression Emphasis

Following the suppression of a very large or catastrophic fire (including ones that may have begun as prescribed fire or wildland fire use), the potential for direct soil impacts rises with the increased number of fire lines constructed to suppress it. In addition, the extensive loss of vegetation could also lead to increased soil erosion. While most natural fires or moderate severity fires are likely to enhance soil development and fertility over the long term due to periodic release of nutrients, extremely severe fires are likely to be detrimental to soils. Soil organic matter can be removed or destructively altered, nutrients volatilized, water capacity decreased, and living plants and microorganisms killed (Brown et.al, 2001). In the aftermath of a large or catastrophic fire, rehabilitation efforts, such as reseeding and filling in fire lines, would minimize soil impacts.

3.4.2.4 Conclusion

Suppression efforts associated with large wildfires could adversely impact soils. These impacts can be mitigated through hazard fuel reduction activities which minimize the probability of large wildfires occurring within the monument. Both the No Action and Proposed Action Alternative offer aggressive hazard fuel reduction programs, therefore the implementation of either of these alternatives would not impair soil and water resources or values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of the monument, (2) key to the natural or cultural integrity of the monument or opportunities for enjoyment of the monument, and (3) identified as a goal in the monument’s general management plan or other National Park Service planning documents.

3.5 Vegetation

3.5.1 Affected Environment

The natural landscape at Lava Beds National Monument has been divided into 23 different vegetation associations (Erhard 1979). While there is a great deal of species overlap between these 23 plant associations, there are certain key species that define broader community types that reflect differences in moisture, temperature and disturbance regimes. Based on the distinctive historical fire regimes, four dominant plant communities have been identified within the monument, along with the special environments in the surface lava flows and around lava tube caves. The four communities and their dominant species are listed in Table 3- 1.

Table 3- 1. Major Plant Community Types of Lava Beds National Monument.

Community Type	Dominant Species
Perennial Bunchgrass	Bluebunch wheatgrass (<i>Pseudoroegneria spicata</i>), Thurber’s needlegrass (<i>Achnatherum thurberianum</i>), squirrel-tail (<i>Elymus elymoides</i>), phlox (<i>Phlox spp.</i>), rabbitbrush (<i>Chrysothamnus nauseosus</i> and <i>C. viscidiflorus</i>), Indian paintbrush (<i>Castilleja</i> spp.), mariposa lily (<i>Calochortus macrocarpus</i>)
	Mountain big sagebrush (<i>Artemisia tridentata ssp. vaseyana</i>), curl- leaf mountain- mahogany (<i>Cercocarpus ledifolius</i> var. <i>intermontanus</i>), bitterbrush (<i>Purshia tridentata</i>), bitter cherry (<i>Prunus emarginata</i>), choke cherry

Sagebrush Steppe	(<i>Prunus virginata</i>), Idaho fescue (<i>Festuca idahoensis</i>), bluebunch wheatgrass (<i>Pseudoroegneria spicata</i>), Thurber needlegrass (<i>Achnatherum thurberianum</i>), and western needlegrass (<i>Achnatherum occidentale</i>)
Juniper Woodland	Western juniper (<i>Juniperus occidentalis</i>), curl- leaf mountain- mahogany (<i>Cercocarpus ledifolius</i> var. <i>intermontanus</i>), mountain big sagebrush (<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>), bitterbrush (<i>Purshia tridentata</i>), bitter cherry (<i>Prunus emarginata</i>), choke cherry (<i>Prunus virginata</i>), sulphur buckwheat (<i>Eriogonum umbelatum</i>), veri- leaf phacelia (<i>Phacelia heterophylla</i> ssp. <i>virgata</i>), and western needlegrass (<i>Stipa occidentalis</i>)
Pine Forest	Ponderosa pine (<i>Pinus ponderosa</i>), Jeffrey pine (<i>Pinus jeffreyi</i>), white fir (<i>Abies concolor</i>), greenleaf manzanita (<i>Arctostaphylos patula</i>), Pacific serviceberry (<i>Amelanchier alnifolia</i>), snowbrush (<i>Ceanothus velutinous</i>), alumroot (<i>Heuchera cylindrica</i> var. <i>glabella</i>), Idaho fescue (<i>Festuca idahoensis</i>), and bluebunch wheatgrass (<i>Pseudoroegneria spicata</i>)
Lava Flows	Purple sage (<i>Salvia dorii</i> var. <i>incana</i>), desert ocean spray (<i>Holodiscus microphyllus</i> var. <i>glabrescens</i>), fernbush (<i>Chamae- atiaria millefolium</i>), California figwort (<i>Scrophularia californica</i>), lichens (several species), and mosses (several species)

Perennial bunchgrasses occupy most of the northern half of the monument, generally at elevations between 4000 and 4500 feet above sea level. Although bluebunch wheatgrass, Thurber’s needlegrass and other native grasses are the dominant plants in this community, there has been some incursion of woody shrubs and isolated junipers into this community over the last century. These changes have come about largely through suppression of natural fire. The grasslands are open, rolling country, and are generally drier than the other plant communities.

The Sagebrush Steppe community occupies the majority of the monument, generally between elevations of 4500 to 5000 feet above sea level. Mountain big sagebrush, bitterbrush, cherry species, and rabbitbrush species are the dominant shrubs in this community. The presence of mature western juniper and curl-leaf mountain- mahogany indicates patches on this landscape that have experienced fire- free intervals outside the expected range of variability (generally greater than 80+ years) and which are in need of restoration with fire (Miller et al 2003).

Juniper woodlands occur in the southeast portion of the monument extending from Valentine Cave north to the Three Sisters Butte, and from the Schonchin Lava Flow east to the monument boundary. This plant community is characterized by a fuel limited combination of western juniper, curl-leaf mountain mahogany, mountain big sagebrush, bitterbrush, and western needlegrass. This area is in a continual state of change between shrub steppe and juniper woodland, where western juniper trees are part of the historic pre- settlement vegetation. This particular plant community does NOT require restoration of fire (Miller et al 2003).

The Pine Forest community is largely confined to the southern end of the monument at elevations above 5000 feet, although patches of forest can extend downhill as low as 4600 feet. Ponderosa and Jeffrey pines are the dominant tree species, with varying amounts of shrubs and grasses occupying the understory. This plant community historically experienced frequent, low-intensity surface fires with mean fire return intervals of 8- 10 years. The increasing density of white fir trees found in this plant community indicates a departure from the historical fire regime.

In addition to the four dominant communities, Lava Beds contains extensive lava flows and numerous lava tubes. These can be found at any elevation, and plant species partly reflect the elevation of the flow. The limited plant abundance and distribution that is observed on the flows is due in part to undeveloped and nutrient- poor soils. Lichen and moss species are the first pioneering plants to colonize on weathered lava, with eventual emergence of grasses, forbs, and even small shrubs and trees over time.

Fire Regimes

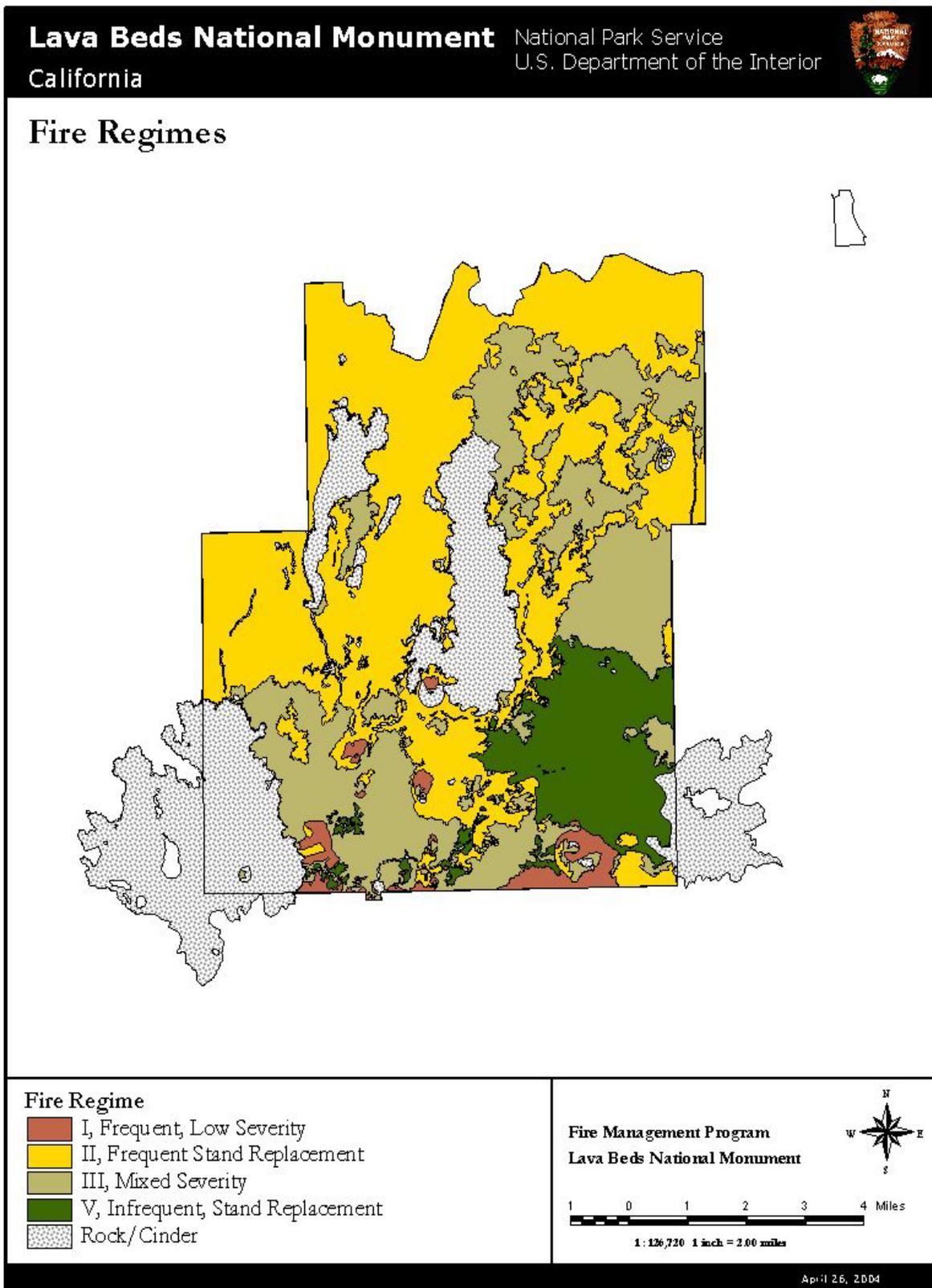
Fire has maintained vegetation in a dynamic state across the monument and limited the establishment of western juniper and curl-leaf mountain mahogany over time. The historical range of variation of pre-settlement vegetation across the monument constantly changed between grassland, shrub steppe, and western juniper woodland. The broad spatial and temporal range in structure and composition of historical vegetation resulted from interactions between climate, the heterogeneous landscape, and the wide range of fire regimes which existed across the monument (Miller et al 2003).

Specifically, differences in site potential (determined by soils, slope, aspect, and elevation) strongly influenced the abundance and structure of fuels, and hence fire behavior. Consequently, fire regimes varied from high frequency/low severity to low frequency/high severity. Historically, mean fire-return intervals ranged from 8- 9 years (1750- 1904) in some plant association types to over 150 years in others. Historical mean fire-return intervals were more frequent in productive sites than in sites where production is limited by moisture availability. Western juniper establishment and the presence or absence of pre- settlement trees of this species appeared to be closely associated with fire regimes (Miller et al 2003). Table 3- 2 summarizes the regimes found at Lava Beds and Figure 3- 1 shows their relative abundance and distribution within the monument.

Table 3- 2. Historical Fire Regimes of Lava Beds National Monument.

Community Type	Mean Fire Return Interval	Fire Regime Characteristics	Fire Regime Class	Fire Frequency & Severity Class
			(from Miller et al 2003)	(from Hann & Bunnell 2001)
Perennial Bunchgrasses	10 - 30 years	Grasslands maintained by frequent fire; fires kill non- sprouting shrubs such as sagebrush which typically regenerate and become dominant within 10- 15 years; fires typically kill most tree regeneration such as juniper and mountain mahogany.	II	0- 35 years frequent stand replacement
Sagebrush steppe	30 - 70 years	Mosaic of different age post- fire shrub patches (> 100 ac) maintained by infrequent fire; fires kill non- sprouting shrubs such as sagebrush which typically regenerate and become dominant within 10- 15 years; fires typically kill most tree regeneration such as juniper and mountain mahogany.	III	35- 100 years less frequent mixed severity
Juniper woodlands	150+ years	Large patches (> 100 ac) of similar age cycled by infrequent fire.	V	> 100 years infrequent stand replacement
Pine forests	8- 10 years	Open forest or savannah structures maintained by frequent fire.	I	0- 35 years frequent low severity
Lava Flows	n/a	No fire	n/a	n/a

Figure 3- 1. Map of Historical Fire Regimes for Lava Beds National Monument.



Non-native Vegetation

Non-native plant species threaten the natural environment at Lava Beds National Monument. The aggressive spread of these species is of great concern to the delicate ecological balance found within the monument's natural environments. Thirty-five species of alien plants have been documented within the park boundaries of Lava Beds. These species of plants have been found along road shoulders, in developed visitor use areas and in sensitive resource areas of the monument's backcountry.

Non-native plants pose serious effects on the environments in which they invade. Native plants and animals suffer these effects most severely. The native plants and animals of Lava Beds compete against invasive plant species and are often suppressed due to the presence of these exotics in the area. Few if any native species utilize these plants as a food source. As these exotic plants invade the areas in which the native plants grow, the native species decrease thus causing a reduction in food and shelter for wildlife. Wildlife populations decline as they are forced to forage elsewhere. The ecological balance between the native plants and animals of the area becomes severely impacted as more exotic species become introduced or further occupy larger areas of habitat within the monument.

Cheatgrass (*Bromus tectorum*) is the most widespread invasive plant found at Lava Beds, which covers more than 15,000 acres of the park. Cheatgrass is a nonnative, typically winter annual grass that has the ability to change an area's fire regime and associated ecosystem. It can assume a spring annual character when fall moisture is limiting and seeds germinate in spring. Cheatgrass reproduces only by seed. Year-to-year variation in environment results in considerable variation in population attributes such as recruitment, survivorship and fecundity. Often the critical factor opening niches for cheatgrass invasion is a heightened disturbance regime. Cultivation and subsequent land abandonment, excessive livestock grazing, overstory removal, and repeated fires can interact, or act singly, to proliferate cheatgrass (FEIS 2004a).

Cheatgrass is more invasive in Wyoming big sagebrush and pinyon-juniper belts than in cooler, more mesic sagebrush types characterized by mountain big sagebrush communities. Cheatgrass does not flourish in mature ponderosa pine, Douglas-fir, grand fir, or western red cedar forests of the Intermountain West. The inability of cheatgrass to persist under these forest canopies is attributed to the influence of shade on the plants' photosynthetic rate and on resource allocation, the short growing season, and the role of herbivory in exacerbating the other factors. Consequently, these forest zones broadly define the current environmental limits of the distribution of cheatgrass in western North America.

Cheatgrass is less invasive in mesic environments, where it does not compete as effectively with established perennial grasses. It may be dominant only in early successional stages, and is eventually replaced by perennial species. When mountain big sagebrush (the most mesic of the big sagebrush subspecies) is replaced by cheatgrass after fire, successional trends may be toward bottlebrush squirreltail and later bluebunch wheatgrass. Cheatgrass may remain a minor component of later successional stages on these sites, occupying the interspaces between perennial plants.

Tumbling Mustard (*Sisymbrium altissimum*) covers approximately 3,000 acres of the park. Like cheatgrass, this species is extensively spread throughout the park making it infeasible to control directly. This exotic is native to Europe and thrives in disturbed areas such as fields, roadsides, and burned sites. This weed is an annual plant that produces yellowish flowers and hundreds of seeds per plant. As an annual, tumble mustard reproduces solely from seed. Seeds disperse when the dead, dried parent plant breaks at the stem base and tumbles or slides across the ground by wind or other movement. The fruits are tough and shatter slowly, so only a few seeds at a time are released. Consequently, the dried plant may disperse seeds throughout fall and winter, across many miles. Animals disperse seeds when the wet, mucilaginous seed coat sticks to feathers or fur. Machinery can pick up branches and whole plants, transporting seeds hundreds to thousands of miles. Tumble mustard requires an open to light canopy, and is most common in early stages of succession.

Tumble mustard establishes from soil- stored seed after fire. Wind, machinery, and animal transport from off- site may provide additional sources of seed or introduce tumble mustard on burns where it was not already present in the soil seed bank. Fire creates conditions favorable for tumble mustard establishment (bare soil, open canopy, reduced growth interference). As a shade- intolerant, invasive species, tumble mustard can thrive in early post fire environments (FEIS 2004b).

Common Mullein (*Verbascum thapsus*) is widespread throughout Lava Beds, covering over 650 acres of park lands. Mullein is a branched biennial. In the first year a rosette of basal leaves is produced. An erect flowering stem reaching up to six feet is produced the second year. The leaves are paddle shaped, upward becoming lance shaped. The spike- like stalk becomes covered with yellow flowers blooming from June to August. Mullein seeds can remain viable for over 100 years. Mullein is an invasive species introduced from Eurasia. Mullein is invasive along roadsides, disturbed or burned sites, waste places, open areas, dry sandy soils, but can establish in undisturbed backcountry.

Tumbleweed (*Salsola tragus*) is an exotic plant originating from Eurasia. This annual forb occupies road shoulders and developed areas of the park in isolated patches where disturbance has been recent. Tumbleweed is a dense plant consisting of an intricate branch arrangement. It grows into a round bushy clump and is covered in thorns. The thorns serve as a deterrent from predators allowing the exotic to grow uninhibited. The plant produces tiny black seeds which disperse as the dead plant blows across the desert floor.

3.5.2 Environmental Consequences

Vegetation impacts were qualitatively assessed using literature reviews and quantitatively assessed by acres impacted.

3.5.2.1 Alternative 1 (No Action) – Continued Implementation of 1992 Plan

Under this alternative 423 acres would be thinned manually and 10,082 acres would be treated with prescribed fires. Generally, hazard fuel treatments would result in the removal of shrubs and trees, and would help restore conditions such that natural fire could be returned to those treated areas in the future. Restoring natural fire regimes in the monument through prescribed fire would benefit all three major plant communities (Bunchgrasses, Sagebrush steppe, and Pine forests) whose health and biologic diversity rely on the presence of fire. Over time, restoring natural fire regimes would result in an increase of fire- tolerant species, while those fire- intolerant vegetative species would decrease.

The overall benefits of fire include reduction of duff material, recycling of nutrients, reduction of accumulating fuels, pruning of trees which reduce ladder fuels into the canopy, and vegetative regeneration through sprouting and fire- stimulated germination (Brown and Smith 2000).

Plant Communities

Perennial Bunchgrasses

Although bunchgrass species vary in their individual susceptibility to fire damage, repeated fires at intervals of about 5- 40 years historically maintained the bunchgrass community. The abundance of individual species varies not only by site conditions but by the actual frequency and seasonal timing of fire. Continual checking and reduction of woody plant encroachment with fire is an important successional process (Brown and Smith 2000).

Prescribed fire can be effectively used to hold back woody plant encroachment and maintain high levels of productivity. The complexity of the bunchgrass community requires careful consideration of species composition and site dryness to design prescriptions for successful prescribed fire (Wright and Bailey

1982). For instance, Idaho fescue is sensitive to fire partly because it is susceptible to smoldering in the clump that can kill plants or reduce basal area. It tends to recover slowly from fire. Burning when soils are moist, such as in the spring, helps to minimize damage (Brown and Smith 2000). Needlegrasses can also be damaged depending on severity of fire. Wright et al (1979) reported that fires in late summer or fall when *Achnatherum spp.* are mature were less damaging than fires earlier in the season.

Sagebrush Steppe

The native plant species that occur in the sagebrush steppe community have co-evolved with fire in that they can successfully establish, grow, and reproduce in a fire-influenced ecosystem. These fire-adapted traits vary by species and can be separated into two categories; those which enhance persistence or survival of the individual and those which ensure persistence or survival of the species (Kauffman 1990 and Kauffman et al 1997). A summary of ecological adaptations to fire by species in the sagebrush steppe community are shown in Table 3-3.

Table 3-3. Fire Adapted Traits of Plant Species Occurring in Sagebrush Steppe.

Species	Individual Survival Traits	Function
Bitterbrush	Basal sprouting	Regrowth from subterranean buds
Rabbitbrush	Basal sprouting	Regrowth from subterranean buds
Prunus spp.	Basal sprouting	Regrowth from subterranean buds
Fescues	Protected buds from dense leaf bases	Protects buds from heat-induced mortality
Bunchgrasses	Protected buds from dense leaf bases	Protects buds from heat-induced mortality
Needlegrasses	Protected buds from dense leaf bases	Protects buds from heat-induced mortality
Species	Species Survival Traits	Function
Big sagebrush	Prolific seeder	High density seedbank
Mountain-mahogany	Windborne seeds	Early deposition of post-fire soils

Specific plant adaptations to fire are adaptations for survival in certain fire regimes only. For example, vegetation adaptations which facilitate survival in a fire regime characterized by less frequent mixed severity fires (e.g. big sagebrush as a prolific seeder) are of little value in cheatgrass-influenced high frequency/high severity fire regimes, where the increased fire frequency can preclude individual sagebrush plants from establishing and reaching a reproductive age.

The composition and structure of existing vegetation in the sagebrush steppe plant community lies outside the range of historical variation for pre-settlement vegetation. This community is currently in the mid succession stage of woodland development. The vegetation is characterized by a dominant overstory of mountain big sagebrush and bitterbrush (45% canopy cover) and young western juniper trees.

Historically, the successional stage of this plant community varied from grassland to shrub steppe, depending on the time since fire. Historically, some western juniper trees would have established in the shrub steppe but would not have reached the degree of maturity some of them have now reached. Continued fire exclusion will eventually result in western juniper woodland, which lies outside the range of historical variation in this plant community (Miller et al 2003).

Under a restored fire regime, it is expected that the cover and density of mountain big sagebrush and bitterbrush would not exceed 20% and western juniper trees would not survive to maturity.

Juniper Woodlands

Tree structure, age distribution, and charred wood across this plant community suggest that the pre-settlement fire regime varied from moderate to high severity with relatively long fire-return intervals. These long intervals likely resulted from the limited continuity and abundance of fine fuels (Miller et al 2003). Periodic fires were probably supported by several years of wetter than average conditions

preceding the fire event to allow the build up of fine fuels (Baisan and Swetnam 1990, Miller and Rose 1999).

The composition and structure of existing vegetation in the juniper woodland plant community lies within its range of historical variation (Miller et al 2003). The current lack of very old trees (> 500 years) except on rock inclusions, the mixed tree-age structure, and an abundance of charred wood across the landscape suggest that although infrequent fire played an important role in past vegetation dynamics, intervals were long enough to allow the establishment of western juniper shrub steppe and woodlands composed of trees exceeding 100 years old. The current plant composition suggests that shrubs and trees will co-dominate after 150 years following a fire, with trees becoming dominant in less than 250 years of initial establishment.

Under the No Action alternative, this plant community would not be targeted for prescribed fire activity. A limited amount of hazard fuels reduction is planned along the perimeter to reduce the risk of unwanted fire escaping from this area.

Pine Forests

Ponderosa pine forests have experienced significant ecological change since fire suppression began. Fire exclusion has allowed a major increase in white fir density and the chances of stand-replacement fire, characteristic of high-severity fire regimes, are much greater now than historically.

Re-introducing fire within the monument needs careful prescription. Due to their altered fuel and forest structure, it is unlikely that fire excluded forests can absorb the shock of naturally occurring fires during the summer months. Such fires would generally be far too intense, consume too much fuel, and cause the death of many of the older, pre-settlement forest trees (Agee 1993). Prescribed fire is essential to restore such sites and can be done through a series of low intensity fires. Attempts to complete the restoration in a single fire are not realistic. Autumn fires appear to harm low vigor ponderosa pines less than spring fires (Swezy and Agee 1991) in *Abies concolor* forests and it is assumed to be true for ponderosa pine forests as well. Once a series of prescribed fires has reduced surface fuel loads, fuel ladders to the overstory, and total tree density, either continued prescribed fires or natural fires can maintain the role of fire into the future of this forest type.

Historically, fires tended to be of low intensity, rarely scorching the crowns of older, mature trees. Fires tended to be small, frequent, and patchy, in that they consumed too little fuel to scar trees. The historical mean fire return interval is 8-10 years (Miller et al 2003). Fire is linked with other disturbance factors in ponderosa pine forests, most notably post-fire insect attack. Scorched trees are more likely to be successfully attacked by western pine beetle (*Dendroctonus brevicomis*), mountain pine beetle (*D. ponderosae*), red turpentine beetle (*D. valens*), or pine engraver beetles (*Ips spp.*). Reduction in tree vigor during drought is also associated with insect attack and major losses in mature and old growth ponderosa pine occurred during the drought of the 1920's and 1930's in the Pacific Northwest. Fire may help control dwarf mistletoe infestation by pruning dead branches and consuming tree crowns that have low hanging brooms.

The process of stand development in ponderosa pine forests is a result of the shade intolerance of ponderosa pine, periodic good years for seedling establishment associated with years of above-normal precipitation, and frequent fire. Gaps in the forest, created by mortality of an existing small, even-aged group, allow the shade-intolerant pine to become established when a good seed year and appropriate climate coincide. In this opening, the stand of young trees will be protected from fire because of lack of fuel on the forest floor, while the fire will burn under mature stands and eliminate any reproduction there. As the trees in the opening continue to grow, they provide enough fuel to carry the fire and thin the stand. Within a group, relatively uniform spacing is the result of moisture competition and a tendency for closely spaced trees to be selectively killed by fire.

Fire normally maintains the forest as an aggregation of very small, even-aged or even-sized clumps. (West 1969). As one clump ages, it is attacked by western pine beetles and then decomposes by fire, scarifying the site for another clump to regenerate. Because of this interaction between fire and beetles, snags tend to be clustered on the landscape, and coarse woody debris is likely short-lived because of frequent fires. Consumption of coarse woody debris naturally inhibits rhizomatous grasses and shrubs and creates growing space for pine regeneration.

Hazardous fuels reduction through prescribed fires and manual treatments would help reduce fuel loadings in this plant community to their pre-suppression levels, thus reducing the chance of stand-replacement fires. These actions would also help return the low-severity fire regime to ponderosa pine forests, which is essential for the health of the community. Suppression activities in ponderosa pine could be beneficial if the forests contain heavy fuel loadings and ladder fuels that could result in stand replacement fires.

Non-native Vegetation

In general, ground crew activities and fire can result in temporary or permanent invasion of non-native species including the four species of most concern discussed above. Among fire suppression actions, fire lines, camps, or heli-spots would be highest priority spots for monitoring. Since shading reduces the potential for exotic encroachment, potentially forested terrain is less likely to be a problem than places on the landscape where shrub/bunchgrass plant communities predominate. During rehabilitation efforts following large or catastrophic fires, any re-seeding of burned areas would be accomplished using native plant genotypes.

Cheatgrass

Live cheatgrass plants are susceptible to heat kill, as with a flame thrower or handled propane torch, though they are difficult to burn when green. When cheatgrass plants are dry enough to burn, they are already dead, and have already set seed. Fire will then reduce cheatgrass plants to ash. Cheatgrass seeds are also susceptible to heat kill, but can survive fires of low-severity if the entire litter layer is not consumed or if seeds are buried deeply enough to be insulated from the heat. The amount of litter or ash left on a site is a good indicator of the amount of cheatgrass seed surviving on that site. Low density of cheatgrass immediately following fire indicates either low numbers of cheatgrass seed in the seed bank, or poor survival of seeds during fire (FEIS 2004a).

The effects of fire on cheatgrass plants and seeds vary with timing and severity of fire and the composition and density of the prefire plant community. If fire occurs when seed remains in panicles above ground, most seeds will be killed and cheatgrass density will decline immediately following fire. The chances of seed surviving fire are enhanced once they have dispersed onto or beneath the soil surface. In sagebrush communities, most of the litter and cheatgrass seeds are found under the canopies of sagebrush plants. The woody biomass of the shrub, plus litter accumulations, provide sufficient fuel to elevate temperatures high enough for a long enough period to consume cheatgrass seeds on these microsites. Some cheatgrass seeds in the interspace zones are also consumed by fire, but many survive even though the cheatgrass herbage is completely consumed. Fire from herbaceous fuel alone is not usually hot enough to consume cheatgrass seeds. Although fires in pure cheatgrass stands, without woody fuel, are less severe, cheatgrass seed banks can be substantially reduced after fire.

Fire facilitates cheatgrass dominance on some sites by interrupting successional trajectories of post fire plant communities, and cheatgrass facilitates fire and can thus shorten the interval between fires. This grass/fire cycle is a serious ecological threat on sites where most native plant species are poorly adapted to fire and is recognized in many ecosystems worldwide. This cycle has been documented in the Great Basin since the 1930s (FEIS 2004a).

Mountain big sagebrush generally has a higher capacity for recovery following disturbance than Wyoming and basin big sagebrush, with a high degree of variability between sites. Cheatgrass increases with grazing in mountain big sagebrush communities, but does not dominate to the extent that it does in drier sagebrush types. Mountain big sagebrush is easily killed by fire, but reestablishes readily from seed and tends to form dense stands after fire. Mountain big sagebrush stands may recover within 15 to 20 years after fire, while stands of Wyoming big sagebrush may not be fully recovered after 50 to 75 years (FEIS 2004a).

Cheatgrass response to fire depends on plant community and seed bank composition, density, and spatial distribution; season of burning; fire severity, frequency and patchiness; scale of consideration; post fire management; and climatic conditions. To mitigate the negative impact of possible cheatgrass dominance at sites within the monument, monitoring cheatgrass responses to fire management activities is necessary.

Tumble mustard

While in the rosette stage, tumble mustard may be top-killed by fire. If the root crown is not damaged, tumble mustard rosettes can sprout new basal leaves from the root crown. As an annual with a single stem, tumble mustard lacks adaptations for regrowth once it has bolted, and plants burned after the rosette stage are killed. Research on fire's impact to the seed bank is lacking, but fire probably has little effect on tumble mustard seed populations. Tumble mustard has tiny seeds that easily fall into fire-safe microsites such as soil crevices. While fire is likely to kill some seed, its overall effect to the tumble mustard seed bank is probably negligible (FEIS 2004b).

Although fire creates the open canopy and bare mineral soil that favors tumble mustard establishment, tumble mustard is not an obligate "fire follower." Any area with bare ground, open sunlight, and a seed source is vulnerable to tumble mustard invasion.

Next to cheatgrass, tumble mustard is the 2nd most invasive alien plant species in the Great Basin. Research suggests that tumble mustard's success as an invasive weed may be due to more effective seed dispersal compared to native herbaceous perennials, morphological plasticity in response to density stress (tumble mustard plants are short with shallow roots when crowded, but still produce numerous seeds), and earlier germination and more rapid seedling growth compared to native herbs (FEIS 2004b).

Tumble mustard does not usually persist in late-seral communities and may not require special control measures. Canopy closure, litter accumulation and/or growth interference from later-successional species tend to exclude tumble mustard over time. Since tumble mustard is an early seral species, minimizing soil disturbance and seed dispersal and maintaining a healthy plant community is the best way to prevent establishment of tumble mustard.

Common Mullein

Research on fire's impact to the seed bank for this species is lacking, but fire probably has little effect on common mullein seed populations which can remain viable in the soil for up to 100 years. Common mullein has tiny seeds that easily fall into fire-safe microsites such as soil crevices.

Although fire creates the open canopy and bare mineral soil that favors this plant's establishment, common mullein is not an obligate "fire follower." Any area with bare ground, open sunlight, and a seed source is vulnerable to common mullein invasion.

Common mullein does not usually persist in late-seral communities and may not require special control measures. Canopy closure, litter accumulation and/or growth interference from later-successional species may tend to exclude common mullein over time. Minimizing soil disturbance and seed dispersal and maintaining a healthy plant community is the best way to prevent establishment.

Tumbleweed

Tumbleweed is an exotic annual that is considered a highly effective reproducer. After seeds mature in late fall the plant stem separates from the root and is then blown by wind. Seeds, held in the leaf axils, fall to the ground as the plant tumbles. Further dispersal is accomplished when wind scatters the winged seeds. One plant typically produces about 250,000 seeds, which remain viable for less than a year (FEIS 2004b).

Tumbleweed is a shade- intolerant initial colonizer in primary and secondary succession. It colonizes barren desert areas that cannot support other flora, and invades many different disturbed plant communities. In disturbed big sagebrush communities, tumbleweed dominates for the first 2 years, often becoming overcrowded and stunted and replaced by other species (FEIS 2004b).

Prescribed burning will not control tumbleweed, since it colonizes from off- site and thrives in disturbed communities (FEIS 2004b). Tumbleweed does not usually persist in late- seral communities and may not require special control measures. Canopy closure, litter accumulation and/or growth interference from later- successional species may tend to exclude tumbleweed over time. Minimizing soil disturbance and seed dispersal and maintaining a healthy plant community is the best way to prevent establishment.

3.5.2.2 Alternative 2 (Proposed Action) – Fire Regime Restoration Emphasis

General vegetation impacts under the Proposed Action would be similar to those described under the No Action Alternative; however, the ability to employ wildland fire use as a fire management strategy would maximize the monument's ability to restore and/or maintain the natural fire regimes of its native plant communities.

3.5.2.3 Alternative 3 – Fire Suppression Emphasis

Under this alternative, hazardous fuels would be reduced on 423 acres through the use of manual thinning. Natural fire regimes would be restored on minimal to no acres because all fires would be immediately suppressed. The cumulative effect of continued fire exclusion within these fire- dependent communities is the degradation of native plant habitat and diversity leading to impairment in the long- term.

3.5.2.4 Conclusion

The implementation of any of the alternatives would not impair vegetation resources or values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, and (3) identified as a goal in the park's general management plan or other National Park Service planning documents.

3.6 Wildlife

3.6.1 Affected Environment

Despite harsh, semi- arid conditions, native wildlife species have adapted to the environmental constraints present in the region. There are no permanent terrestrial water resources in Lava Beds National Monument. Some animals obtain water from caves, while others use Tule Lake which forms the north boundary of the monument. Because of the harsh environmental conditions, some species of wildlife migrate to and from the monument seasonally, while others remain as permanent residents.

There are no fish species present at Lava Beds due to the semi- arid conditions. Amphibians have specific habitat requirements that are severely reduced in the monument and therefore are found in very limited numbers. Informal inventories of animal species occurring in the monument have been ongoing since the area was designated a monument in 1925. Since the 1960's, monument staff and researchers have been conducting a full array of formal inventories to document the fauna found at the monument. The results of thirty plus years of inventories are shown below.

Table 3- 4. Known Numbers of Species by Taxa at Lava Beds National Monument.

Taxa	Species Count
Mammals	56
Birds	233
Reptiles	12
Amphibians	2
Fish	0

Of the 303 inventoried vertebrate species within the monument, the bald eagle (*Haliaeetus leucocephalus*) is the only listed federally threatened species (USFWS, 2004). The state of California maintains a state species of concern for flora and fauna. Species of concern on the state list for Lava Beds includes six bat species and eight bird species. These state listed species, found below in Table 3- 5, are known to occur within the monument and could be influenced by fire management activities. Species of Concern are sensitive species that have not been listed, proposed for listing nor placed in candidate status. Species of concern is an informal term used by some but not all U.S. Fish & Wildlife Service offices. Species of concern receive no legal protection and the use of the term does not necessarily mean that the species will eventually be proposed for listing as a threatened or endangered species (Sacramento Fish and Wildlife Office 2004).

Table 3- 5. Federal and State Animal Species of Concern.

Species	Status	Habitat
Bald eagle (<i>Haliaeetus leucocephalus</i>)	Federally Threatened	Ponderosa pine woodlands used for winter roosting
Fringed myotis (<i>Myotis thysanodes</i>)	Species of Concern	Lava tube caves
Townsend's big- eared bat (<i>Corynorhinus townsendii</i>)	Species of Concern	Lava tube caves
Long- legged myotis (<i>Myotis volans</i>)	Species of Concern	Lava tube caves
Small- footed myotis (<i>Myotis ciliolabrum</i>)	Species of Concern	Lava tube caves
Yuma myotis (<i>Myotis yumanensis</i>)	Species of Concern	Lava tube caves
Red- breasted Sapsucker (<i>Sphyrapicus ruber</i>)	Species of Concern	Ponderosa pine woodlands
White- headed Woodpecker (<i>Picoides albolarvatus</i>)	Species of Concern	Ponderosa pine woodlands
Flammulated Owl (<i>Otus flammeolus</i>)	Species of Concern	Ponderosa pine woodlands
Lewis' woodpecker (<i>Melanerpes lewis</i>)	Species of Concern	Ponderosa pine woodlands
Species	Status	Habitat
Olive- sided Flycatcher	Species of Concern	Ponderosa pine woodlands

<i>(Contopus cooperi)</i>		
Western Burrowing Owl <i>(Athene cunicularia hypugaea)</i>	Species of Concern	Sagebrush grasslands
Swainson's Hawk <i>(Buteo swainsoni)</i>	Species of Concern	Sagebrush grasslands
Sage Grouse <i>(Centrocercus urophasianus)</i>	Species of Concern	Sagebrush grasslands

Approximately 50% of the California population of the federally listed threatened bald eagle uses the Klamath Basin as a wintering area. The monument provides two of the five primary winter roosting sites for this population (Caldwell/Cougar Bald Eagle Winter Roost Management Plan, 1992). The number of bald eagles using these monument roost sites has fluctuated from a high count of 278 in 1984 to as low as 4 – 5 birds in 2004. Roosting habitat includes the ponderosa pine forests that occur at the southern portion of the monument. According to Miller et al (2003), these forests have historically experienced frequent low- intensity fires (median fire- return intervals of 8- 9 years between 1750- 1904).

The five species of bats that are listed by the state of California in Table 3- 5 all occupy lava tube cave habitats within Lava Beds National Monument. The monument has been conducting an annual hibernaculum and maternity survey of the Townsend's big- eared bat populations since 1996. While this species has experienced a drastic decline in numbers elsewhere in the western U.S. as a result of habitat destruction and roost disturbance (Pierson and Fellers 1998), Lava Beds National Monument remains a stronghold. Cave roost monitoring at the monument has confirmed populations of this species have been stable and are currently increasing. This trend is attributed to the habitat preservation and bat colony protection actions taken by the National Park Service (Fuhrmann, 2004).

The other four species of bats in Table 3- 5 are found in low numbers on an annual basis in the lava tube caves and foraging at night over the monument. These bats have been detected during monument night surveys using Anabat equipment, which detects bats sonar as they fly and feed overhead using echolocation.

Red- breasted Sapsucker, White- headed Woodpecker, Lewis' Woodpecker, Olive- sided Flycatcher and Flammulated Owl are all recognized as Species of Concern for the State of California. All these species of birds are found in the ponderosa pine woodlands of the monument. Lewis' Woodpecker, Olive- sided Flycatcher and Flammulated Owl are migratory species that breed during the summer at the monument. The Red- breasted Sapsucker and White- headed Woodpecker are resident species. All five species can be considered common, except for the Flammulated Owl which is considered uncommon in the monument.

The Western Burrowing Owl, Swainson's Hawk, and Sage Grouse are all Species of Concern for the state of California in the sagebrush grassland habitats of the monument. Western Burrowing Owl is a rare bird for the monument, only observed a few times a year, and is dependent on burrows and healthy grasslands. The Swainson's Hawk is a migrant that breeds during the summer in the Klamath Basin. This hawk is considered uncommon in the summer months at the monument and primarily feeds on insects and rodents. This hawk will nest in open grasslands where isolated trees provide a nest platform away from predators.

The Sage Grouse is a species of bird that is becoming very rare in the region surrounding Lava Beds. There are historic records documenting this bird at the monument, but no confirmed sighting of this species has been made in the monument for three decades. This species of bird is very dependant upon intact sagebrush habitats for breeding, nesting and foraging. One of the last remaining populations of this bird is found 15 miles east of the monument at Clear Lake National Wildlife Refuge.

3.6.2 Environmental Consequences

Wildlife impacts were qualitatively assessed using presence/absence determinations, GIS overlays of treatment units and protected species and their habitats, and mitigation measures.

3.6.2.1 Alternative 1 (No Action) – Continued Implementation of 1992 Plan

Animal species, like plant species, evolved through a series of "coarse filters" of environment and habitat. Fire was one of the coarse filters that "managed" habitat through time before the monument was established. Prescribed fire would have short-term impacts on animal populations by eliminating cover, food sources, and habitat. Injury and mortality are possible outcomes for some individuals. In addition, heavy smoke may temporarily force animals to temporarily vacate some areas. In the long term, habitat changes resulting from fire have a greater impact on animal populations and communities than the fire itself (USDA, 2000b).

Frequent, low-intensity fires generally change habitat structure less severely than mixed-severity or stand-replacement fires. Stand-replacement fires reduce habitat quality for species that require dense cover and improve it for species that prefer open sites. Re-introduction of fire as a management tool in the monument would have beneficial impacts to fire-dependent faunal species and adverse impacts to fire-intolerant ones. Landscape-scale fire affects on fauna also include changes in availability of habitat patches and heterogeneity within them; changes in the composition and structure of larger areas, such as watersheds, which provide the spatial context for habitat patches; and changes in connections among habitat patches (USDA, 2000b).

Fire can cause a short-term increase in productivity, availability, or nutrient content of forage and browse. These in turn may contribute to an increase in herbivore populations, although such increases may be moderated by animals' ability to thrive in an altered environment. Small carnivores are affected by fire's affect on their prey; effects can be positive or negative. Large carnivores and omnivores have extensive home ranges and their populations may change little in response to fire; however, they thrive where their preferred prey is most plentiful, often in areas of recent burns. Fire may benefit raptors by reducing cover and exposing prey. Other bird species, such as woodpeckers, may benefit from population explosions of wood-boring insects.

In the long term, it is expected that reintroducing fire would provide for greater habitat diversity and less catastrophic habitat loss. Fire management provides for the least amount of disturbance overall by reducing the chance of catastrophic fires and allowing for incremental changes over time.

Unlike the plant species, none of the threatened/endangered/sensitive animal species are endemic to Lava Beds National Monument, and the "threats" to their existence have largely occurred due to land management activities elsewhere (e.g., pesticide applications affecting bald eagles).

Bald eagle

Prescribed burning in the ponderosa pine forests would likely reduce the threat of catastrophic fire in the southern portion of the monument, while maintaining adequate roosting trees for bald eagles. Hunting territories and flight corridors would be unchanged or enhanced. There is the expectation that prescribed fire would have positive effects, if any, on the maintenance and improvement of the roosting areas. The historic control of fire events in the bald eagle roosts potentially threatened the continued generation of this forest type. Prescribed burning in the ponderosa pine forests would enhance bald eagle roost features (e.g., maintain open forest canopies of large pine trees which provide good sight distance for flight corridors to feeding areas while promoting regeneration of forest cover where bald eagles can find protection during severe weather events).

The following mitigation measures will minimize the probability of any adverse effects to bald eagles:

- Consultation with the USFWS will be completed for all prescribed fire activities within bald eagle roost areas;
- Fire suppression strategies will be sensitive to bald eagle roost resources;
- A resource advisor will be assigned to all fires in areas involving bald eagle roosts to mitigate potential impacts.

Bats

Prescribed burning in the ponderosa pine forests, juniper woodlands, and sagebrush steppe would likely contribute to the maintenance of prey species populations and habitat structure requirements for foraging bats over the monument. One study at Lava Beds showed that Townsend's big-eared bat fed extensively in association with trees. Prime foraging time was spent either in the upland ponderosa pine forest or in juniper and mountain mahogany habitat (Pierson and Fellers, 1998).

Fire effects on bats from smoke emissions affecting roosting patterns in caves and feeding patterns could have very little measurable effect on bat populations in the monument to potential adverse impacts, depending on the cave location and duration of fire. Many bat species, including the Townsend's big-eared bat do not move far from preferred caves and have great site fidelity. Active burning of fuels at the entrance of caves could produce potential short-term smoke impacts into cave environments. The presence of smoke during nightly forays and access to prey would not likely be impacted. The biggest impact documented on Townsend's big-eared bat populations is from human disturbance. The entering of caves by humans where these bats have maternity or hibernating populations can cause adverse effects on bat population numbers and the future use of these preferred caves.

Birds

Prescribed burning in the ponderosa pine forests, juniper woodlands and sagebrush grasslands would likely contribute to the maintenance of prey species populations and habitat structure requirements for migratory and resident birds, including the species of concern listed above. Conducting prescribed fire activities during spring and early summer can have potential positive and negative impacts on bird populations. Nesting birds can lose nests and broods to fires, since many species nest on the ground, including a number of sparrow species, western meadowlark and burrowing owls. Fire activities in spring and early summer can also potentially benefit foraging success for raptors, such as the Swainson's hawk, which primarily feeds on insects and small mammals. The use of prescribed fire in sagebrush grasslands can have the potential positive results of re-introducing a mixed vegetation community type of forbs and shrubs that the sage grouse depends on.

3.6.2.2 Alternative 2 (Proposed Action) – Fire Regime Restoration Emphasis

General impacts to wildlife would be similar to those described in the No Action Alternative. The inclusion of wildland fire use would benefit bald eagles and bats by allowing for the natural cycling of habitat structures on additional acres across the landscape. Any increases in prey species populations would also be a benefit.

3.6.2.3 Alternative 3 – Fire Suppression Emphasis

General impacts to wildlife would be less than those described in the No Action and Proposed Action Alternatives. The exclusion of prescribed and wildland fire use would delay the restoration of natural fire regimes to some areas of the monument and reduce the habitat benefits derived from applications of fire in sagebrush and bunchgrass communities. In addition, those areas deprived of prescribed and wildland fire use would continue to accumulate ground and ladder fuels, thus increasing the potential for intense, stand replacement fires. Stand replacement fires, depending on their locations, could directly impact bald eagles and bats and their prey base.

3.6.2.4 Conclusion

The implementation of any of the alternatives would not impair wildlife resources or values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, and (3) identified as a goal in the park's general management plan or other National Park Service planning documents.

3.7 Cave Resources

3.7.1 Affected Environment

There are over 500 known caves and other lava tube features within the monument, with a combined length of over 28 miles of passageway. Lava Beds has the largest known concentration of lava tube caves in the lower 48 states. Caves in Lava Beds National Monument typically were formed during the eruption of basaltic lavas in the late Pleistocene (over 10,000 years ago), a process which has not happened historically in the area, thus they are non-renewable geologic resources. Lava Beds contains over 30 separate lava flows located in the monument that range in age from 2,000,000 years BP to 1,110 years BP. Many of these lava flows contained segments of lava tube systems that once carried flowing lava as far as 10 mi (16.7 km) from its source. Cave resources at Lava Beds typically contain abundant well-preserved lava features such as levees and gutters, lava cascades, linings, balconies, natural bridges, lava lakes, rafted blocks, blisters, and lava stalactites and stalagmites. Caves also contain small secondary mineral deposits, including calcite, gypsum, and opal speleothems. Loose boulders, called breakdown, which form from the collapse of the ceiling or walls are also commonly found in many caves.

Many caves support bat populations, including one of the northernmost maternity colonies of Brazilian free-tailed bats (*Tadarida brasiliensis*). A relatively large population of Townsend's big-eared bats (*Corynorhinus townsendii*), a species of special concern, occupies monument caves throughout the year forming some of the largest bat hibernaculums on the west coast. Many caves are culturally significant, both archaeologically and historically. Prehistoric rock art and artifacts in and near the entrances to caves are evidence of early human use of the caves. The caves of Lava Beds were well known and used by native Americans, as evidenced by pictographs and artifacts inside and close to cave entrances. Many cave-related archeological sites are documented in the monument. More recently, the Modoc Indians used caves, collapses, and ledges to strategic advantage in the Modoc War of 1872-73, hiding from and firing on federal troops during the conflict.

The cool, damp climate within the caves offers different plant and animal species a variety of microclimates that allow for their existence in near-desert conditions where they would not ordinarily survive. Lichens, mosses, ferns, and vascular plants, tree frogs, and various insects and mammals (e.g. pika) are found in and around cave entrances. The deeper passages of the caves can harbor bats, woodrats, bacterial colonies (known as cave slime), and cave adapted insects, as well as other creatures adapted to the cool, damp, dark conditions inside.

In summary, Lava Beds' caves are non-renewable resources, unique in their extent and degree of preservation, and are geologically, biologically, and culturally significant.

3.7.2 Environmental Consequences

3.7.2.1 Alternative 1 (No Action) – Continued Implementation of 1992 Plan

Sensitive resources near cave entrances including bats and cave structures would be subject to temporary smoke exposure during prescribed and wildfire suppression activities on 10,082 acres over five years. Smoke exposure from any single prescribed or wildland fire incident is expected to be of short duration (2-4 days per event). The removal of small amounts of vegetation around cave entrances may occur from wildfires depending upon the arrangement and continuity of fuels, prevailing winds and fire behavior. Post-fire vegetative response will vary by species depending on specific adaptations to fire; but are expected to be within the range of natural variability.

The following mitigation measures will minimize the probability of any adverse effects to cave resources:

- Prescribed fire ignitions will not take place in cave entrance collapses;
- Foams and retardants will not be used within 200 feet of known cave openings unless there is an imminent threat to human life or property;
- Fire suppression strategies will be sensitive to cave resource values, by not tying control lines into cave entrances unless they are being used as natural fuel breaks;
- Prior to all wildland fire and fire use activities, cave locations will be scouted and efforts made to avoid cave entrances;
- A resource advisor will be assigned to all fires in areas involving cave resources to mitigate potential impacts to maternal and hibernating bat colonies.

3.7.2.2 Alternative 2 (Proposed Action) – Fire Regime Restoration Emphasis

The general impact to cave resources under the Proposed Action would be similar to those described in the No Action Alternative. The same number of acres is proposed for prescribed fire and hazard fuels treatment. The application of wildland fire use would increase the amount of smoke emissions potentially generated at or near cave entrances, but the mitigation measures listed above would minimize any potential adverse effects.

3.7.2.3 Alternative 3 – Fire Suppression Emphasis

The general impact to cave resources under Alternative 3 is less than for the No Action and Proposed Action Alternatives as fewer fire management activities are proposed (423 acres compared to 10,505 acres).

A delay in restoring natural fire regimes to the monument would increase the likelihood of the monument experiencing extensive and intense wildfires that emit large volumes of smoke. Depending on the time of year and the location of the fire, such smoke could damage prehistoric rock art and artifacts in and near cave entrances, and pose a health risk to the resident bat colonies including mortality of individuals.

3.7.2.4 Conclusion

The implementation of the No Action and Proposed Action alternatives would not impair cave resources or values that are (i) necessary to fulfill specific purposes identified in the enabling legislation of the park,

(2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, and (3) identified as a goal in the park's general management plan or other National Park Service planning documents.

3.8 Wilderness

3.8.1 Affected Environment

Between 1972 and 1974, two wilderness units (Schonchin and Black Lava Flow) totaling 28,460 acres were designated under public laws 92-493 and 93-477 at Lava Beds National Monument. Accordingly, wilderness currently represents 61% of the monument's total land area. The Lava Beds Wilderness is isolated, with the next closest wilderness areas being the Mountain Lakes Wilderness, 45 miles to the northwest, and the South Warner Wilderness, approximately 65 miles to the east.

The Wilderness Act restricts activities in designated wilderness areas. No forms of mechanical transport, no permanent roads, and only "minimum tools" are permitted in wilderness...as may be necessary in the control of fire..."

The Wilderness Act also calls for the perpetuation of natural processes within areas designated as wilderness. Naturally occurring fire caused by lightning or volcanic activity has been a powerful force in shaping the monument's biotic communities. As much as possible, fire will be managed as a natural force within the wilderness boundaries of the monument. These fires will be managed as prescribed natural fires and will be guided by strict prescriptions. Management ignited prescribed fire may be used in monument wilderness areas to enhance the application of the prescribed natural fire program. Areas may be treated with management ignited prescribed fire to initially reduce loadings and to ensure that naturally occurring fires may be managed within their prescriptions (NPS 2004).

Lava Beds National Monument manages its caves within designated wilderness areas as underground "wilderness" (NPS 1996).

Within Lava Beds National Monument, there are nine official entry locations accessing the Lava Beds Wilderness. Currently, there are 39.7 miles of maintained trails in the backcountry and wilderness areas of the park. There are no designated campsites located within the wilderness. There are currently no administrative structures in the wilderness.

The Wilderness Act defines wilderness as "an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements..."

3.8.2 Environmental Consequences

3.8.2.1 Alternative 1 (No Action) – Continued Implementation of 1992 Plan

The restoration of natural fire regimes to plant communities within the monument, particularly those within designated wilderness, is consistent with the restoration and preservation of wilderness values as described in the Wilderness Act. Wildland fire operations within the Schonchin and Black Lava Flow Wilderness Areas will adhere to the requirements of the Wilderness Act, NPS Management Policies, and the NPS Director's Orders #18 and #41 Wilderness Preservation and Management. All wilderness fire management activities will employ minimum actions and tools necessary based upon the Minimum Requirement and Minimum Tool Determination. All fire management activities within wilderness will follow established MIST implementation guidelines. All wilderness fire management activities will follow established Rehabilitation Guidelines for Wilderness Fire Suppression Activities. A Resource Advisor should be

available for advice and support with the crew(s) as well as for quality control. When wilderness travel routes or trails are closed during fire management activities, visitors will be rerouted to alternative travel routes or campsites.

Noise generated from manual fuel treatment activities may be heard on several wilderness trails. To mitigate the effects, the monument would prohibit fuel treatment activities in these sensitive areas during holidays. In addition, the trails that are within or adjacent to these treatment units may be closed to visitors during project implementation.

To help mitigate this impact, educational/informational materials will be developed and distributed to the wilderness visitor on what to expect during fire management activities including potential noise from chainsaws during line construction, smoke dispersion, safety, helicopter and airplane use, and information on where and when these activities would occur.

In light of the above mitigation measures, there would be only minor, short- term impacts to wilderness.

3.8.2.2 Alternative 2 (Proposed Action) – Fire Regime Restoration Emphasis

Wilderness impacts under the Proposed Action would be similar to those described under the No Action Alternative. In addition, the application of wildland fire use would positively impact wilderness character and resources.

3.8.2.3 Alternative 3 – Fire Suppression Emphasis

The general impacts to wilderness values under Alternative 3 would be less than those described under Alternatives 1 and 2, as fewer fire management activities are proposed (423 acres compared to 10,505 acres) and all of the proposed activities would occur outside of the two wilderness areas.

3.8.2.4 Conclusion

On condition that equipment used during fire management activities was codified under a minimum requirement assessment, the implementation of any of the alternatives would not impair wilderness values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of the monument, (2) key to the natural or cultural integrity of the monument or opportunities for enjoyment of the park, and (3) identified as a goal in the monument's general management plan or other National Park Service planning documents.

3.9 Visitor Use and Experience

3.9.1 Affected Environment

Lava Beds National Monument is open year- round. Approximately half of the visitation occurs during the summer months of June through August. Annual visitation between 1980 and 1995 consisted of a low of 92,000 in 1984 and a high in 1993 and 1994 of 180,000. Highest visitation periods are summer weekends, and the lowest occurs on cold, snowy days during winter. Typical monthly visitation percentages for Lava Beds are a low of 2% in January and a high of 24% in July.

Visitors enter the monument primarily from the north, with 75 percent of the visitors evenly split between the two northern entrance roads. From the south, 20 percent of visitors enter from the southeast via Forest Highway 10, while the remaining 5 % enter the monument on the Medicine Lake Road.

Visitor use areas and facilities include two self-guiding trails, a visitor center, a 42-site campground, a group camp area, two picnic areas, and 24 wayside exhibits.

The average visitor stay is approximately 5 hours.

Visitation is projected to increase to about 210,000 in 2010 based on an expected increase rate of 1 percent per year. This is consistent with growth rates projected for other northern California recreation destinations (NPS 1996).

Visitor exploration of caves is one of the most popular activities within Lava Beds National Monument. Approximately 15 front-country caves have been monitored for visitor use levels since 1990. In some of the most popular front-country caves, visitor-use levels on an annual basis exceed 16,000 visitors. In backcountry caves and caves located in wilderness areas where cave registers are used, visitation can be extremely low. Between 1995 and 2000, 18 backcountry caves contained registers to document use. The range of visitation in these caves fluctuated between a cave with 15 visitors over the five year period and a cave with 4,000 visitors during the same period.

Hiking on monument trails is another popular visitor experience at Lava Beds. The front-country of Lava Beds contains 20 short trails that total approximately 1 mile. These trails are found around the visitor center and at the entrances to many front-country caves. In the backcountry of Lava Beds there are 16 trails totaling 9.3 miles. In the wilderness of Lava Beds, there are 7 trails totaling 30.4 miles.

Wilderness use has fluctuated several times over the past decade. Average overnight use of the Lava Beds National Monument backcountry was approximately 26 visitor nights. A record 103 visitor nights was recorded in the monument Wilderness in 1995 (number of visitors multiplied by the number of nights = visitor nights). The year 1997 was second with 32 visitor nights and 1991 third with 28 visitor nights.

Over the past decade day hiking, overnight use (backpacking), and caving were the park's principal wilderness activities. Pack and trail riding stock use accounts for less than 1% of wilderness use. Caving and hiking account for most of the day use activity within the wilderness. Day use far exceeds overnight use.

Monument wide, the bulk of overnight use occurs in June, July, and August. Day use winter activities are limited to occasional hikers.

3.9.2 Environmental Consequences

Recreation impacts were qualitatively assessed in light of the timing, intensity, and duration of fuel treatment activities as they related to visitor use and experience.

3.9.2.1 Alternative 1 (No Action) – Continued Implementation of 1992 Plan

Possible factors impacting recreation include smoke, noise, changes in scenic vistas, and visitor use restrictions.

Smoke from prescribed fires near developed areas may impact recreation in a number of ways. Visitors may experience temporary discomfort or decreased visibility if woodland smoke moves into developed areas or near trails. If portions of the monument were closed to tourists because of smoke-related health and safety reasons, recreation would be adversely impacted. Any use restrictions imposed by the monument would be temporary, except in the case of nearby stand replacement and/or catastrophic fires.

Restoration of natural fire regimes in the plant communities across the monument would lessen the potential for extensive unwanted fires.

If located near developed areas or within viewsheds of the monument, prescribed fire and manual fuel treatments would also have short-term impacts on foreground scenic quality through the killing of grasses, shrubs and trees. Over time, as the areas green up, scenic quality would improve above pre-fire levels.

Depending on the location of fires in other parts of the monument, visitors might be required to make adjustments to activities, such as altering hiking or spelunking routes. Under normal circumstances, prescribed fire and hazard fuel treatments would not affect visitors' ability to enjoy a full range of recreational activities.

Hazard fuels reduction activities near developed areas, highly frequented trails and in wilderness areas, or during times of special park events or holidays, could impact the recreational experience of some visitors. To minimize these potential noise and visual impacts, the monument would not initiate hazardous fuels reduction activities, such as prescribed fire, near developed areas and trails during holidays. In addition, the monument would limit, to the extent practicable, fire prevention and hazard fuels reduction efforts near developed areas and trails to periods of low recreation visits, or temporarily prohibit access to certain areas where treatments were being undertaken.

In addition, educational/informational materials would be developed and distributed to visitors on what to expect during fire management activities including potential noise from chainsaws during line construction, smoke dispersion, safety, helicopter and airplane use, and information on where and when these activities would occur.

3.9.2.2 Alternative 2 (Proposed Action) – Fire Regime Restoration Emphasis

General impacts to recreation would be similar to those described in the No Action Alternative. The inclusion of wildland fire use would indirectly benefit recreation by reducing the chance of temporary and long-term use restrictions that could arise from a stand replacement and/or catastrophic fire near developed areas and recreation trails. In the short term, however, temporary use restrictions may be implemented during times of wildland fire use.

Wildland fire use would have effects on background long-distance vistas. However, after the first year, when dead trees and shrubs turn brown and loose foliage, they would add visual texture to an already heavily textured landscape created by the effects of topography, soil, and different species and age classes of shrubs.

3.9.2.3 Alternative 3 – Fire Suppression Emphasis

Under this alternative, the exclusion of prescribed and wildland fire use could result in a decrease in use restrictions to park visitors and positively benefit recreation in the short term. However, delay in restoring natural fire regimes to the monument would increase the likelihood of a future stand replacement or ecosystem-damaging fire near developed areas and or hiking trails.

3.9.2.4 Conclusion

The implementation of any of the alternatives would not impair visitor use and experience values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of the monument, (2) key to the natural or cultural integrity of the monument or opportunities for enjoyment of the park, and (3) identified as a goal in the monument's general management plan or other National Park Service planning documents.

3.10 Socioeconomics

3.10.1 Affected Environment

Lava Beds National Monument straddles Modoc and Siskiyou counties of northern California, with a combined population of 53,750. The population of neighboring Klamath County, Oregon is 63,775. Education, health and social services, agriculture, forestry, commodity transportation, and retail trade are the major elements of the tri- county economies (USCB, 2004).

In addition to the monument, the upper Klamath Basin is home to several National Wildlife Refuges, a Volcanic Scenic By- Way, Crater Lake National Park, and numerous natural amenities and community services which bring visitors to the area each year. Agriculture and timber employment is not expected to increase in the near future, and the counties look to increasing economic diversification to aid economic growth. Tourism is an important part of a growing employment sector that includes the Arts, entertainment, outdoor recreation and tourism (USCB, 2004).

The monument averaged 125,997 recreational visitors for the years 1992- 2003 (DOI 2004b). Each visitor is required to pay an entrance fee. Single, private, non- commercial vehicles are charged \$10; pedestrians, single motorcyclists, and bicyclists are charged \$5; and commercial buses are charged anywhere from \$25 to \$200, depending on capacity. More than 70% of the monument's annual visitation comes during the period May- October (DOI 2004b).

Using the MGM2 model developed by researchers at Michigan State University, it is possible to derive a rough estimate of the economic benefits to the local community due to monument visitation (DOI 2004c). The model uses as inputs the number of annual recreation visits, broken down into local, non- local day use, and overnight visits, including stays at motels and campgrounds, to generate estimates of economic effects on the local community due to the presence of the NPS unit. The following inputs were used to calculate the economic benefits of the monument:

- 22,420 local visits, from the three surrounding counties of Modoc, Siskiyou, and Klamath Counties
- 22,420 visitors who stayed overnight in motels
- 7,390 visitors who stayed overnight in campgrounds, RVs, or backcountry camping
- 61,654 non- local day- users (DOI 2004c)

The model uses a nationwide average of party size and length of stay in motels and campgrounds for National Park visitors, as well as average spending per party at a rural National Park, to convert the visitation information to estimates of economic benefits. Using the above inputs it is estimated that Lava Beds National Monument brings in approximately \$2,180,000 in local wages and 130 jobs for persons involved in the tourism industry.

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations*, directs federal agencies to identify and address any disproportionately high adverse human health or environmental effects of its projects on minority or low- income populations.

Minority populations constitute approximately 14% of the total population in the tri-county area compared to a national average of 25% (USCB 2004). Using the Census Bureau's categories, the largest racial group is American Indian and Alaska native (4%), followed by those who said they were of two or more races (3%), and those who said they were some other race (3%). Asian, Black or African American, and Native Hawaiian groups each made up less than 1% of the tri-county population. In addition, 9% of the population identified themselves as Hispanic or Latino; persons in this category can be of any race.

The median household income for Modoc, Siskiyou and Klamath Counties was \$29,530 in 1999 (USCB, 2004) compared to the national median income of \$41,994 for the same year. In 1999, more than 19% of tri-county residents were reported to be living in poverty, compared to a national average of 12.4%. Modoc and Klamath counties experienced unemployment rates ranging from 7.0 – 9.9% for the 12 month period between February 2003 and January 2004, while Siskiyou County reported > 10% unemployment. These unemployment rates are significantly higher than the national average of 6.0% for the same period (USBLS 2004).

3.10.2 Environmental Consequences

Socio-economic impacts were quantitatively assessed using U.S. Census Bureau data on personal income, population data, and poverty measures.

3.10.2.1 Alternative 1 (No Action) – Continued Implementation of 1992 Plan

The most probable socioeconomic impact would be the loss of revenues to the monument and local tourism-related businesses as a result of use restrictions, road closures, or partial to complete park closures in response to fire and excessive smoke. Use restrictions and road closures would likely be temporary and infrequent, and of a nature that would not significantly reduce NPS revenues generated from entrance fees or compromise local tourism businesses. A large wildfire that destroyed developed areas within Lava Beds or that resulted in the prolonged closure of part or all of the monument would have significant socioeconomic impacts (e.g. damage and loss of property; temporary and prolonged loss of jobs; and loss of revenues to the monument and surrounding businesses from a decrease in tourism); however, the likelihood of such a fire is small and the implementation of the Fire Management Plan would further reduce the possibility of such an event.

Percentages of minority or socio-economically disadvantaged persons in Modoc, Siskiyou and Klamath Counties are below the national averages for these categories, and the probability of a disproportionate impact to these populations resulting from the implementation of the Fire Management Plan would be minor. The confederated Klamath Tribes are headquartered in Chiloquin, Oregon, more than 80 miles north of the monument. In light of the distance separating the Tribes and the monument, it is unlikely that a catastrophic fire originating in the monument would directly impact the community.

3.10.2.2 Alternative 2 (Proposed Action) – Fire Regime Restoration Emphasis

General socioeconomic impacts for the Proposed Action would be similar to those described in the No Action Alternative. With the added capability of managing natural ignitions the probability of a large, high-intensity wildfire would be further reduced.

3.10.2.3 Alternative 3 – Fire Suppression Emphasis

General socioeconomic impacts for Alternative 3 would be more negative than those described in the No Action and Proposed Action Alternatives. There would be a greater chance of revenue loss to the monument and local tourism-related businesses as a result of use restrictions, road closures, or partial to complete park closures in response to large, devastating fires and excessive smoke. With limited fuel treatments and the exclusion of prescribed fire, the likelihood of unwanted fires crossing jurisdictional boundaries would increase with time due to accumulating fuels and increased exposure to natural and human ignition sources.

3.11 Cumulative Effects

This cumulative effects analysis considers the past, present, and reasonably foreseeable future actions on land uses that could intensify or offset the effects on the resources and that may be affected by the Fire Management Plan alternatives. Cumulative effects vary by resource and the geographic areas considered here are the monument and adjacent areas. In some instances, activities may result in both negative and positive impacts when considering the short and long-terms. As a result, some resource categories in Table 3-6 show both positive and negative impacts resulting from a particular activity. The information provided in Table 3-6 is the basis for the cumulative effects described in Table 3-7. A significant cumulative effect for any issue topic would be the “significant” impact as described in Table 2-10 in Section 2.5 – *Impact Definitions*.

Table 3-6. Factors Affecting Cumulative Effects Determination.

	Human Health & Safety	Air Quality	Cultural Resources	Soils & Water	Vegetation	Wildlife	Cave Resources	Wilderness	Visitor Use and Experience	Socio-economics
Past prescribed fires and thinning in the monument	+-	-	+-	+-	+-	+-	+-	+-	+-	
Lightning & human-caused wildfires	+-	-	+-	+-	+-	+-		+-	+-	
Wildfire suppression past, present, future	+	+	+-	+-	-	-	+-	+-	+-	+
Timber management on adjacent federal lands				+-	+-	+-				+
Visitation to the monument		-					+-		+	+
Hazardous fuels reduction on adjacent federal lands	+	-	+-	+-	+-	+-		+		
Research and monitoring efforts in the monument	+	+	+	+	+	+	+			

DIRECT/INDIRECT EFFECTS KEY: (+) Positive/beneficial; (-) Negative/detrimental; (Blank) Neutral/no effect

Table 3-7. Cumulative Effects Summary.

Resource	Past and Present Actions	Proposed Actions	Future Actions	Cumulative Effects
Human Health & Safety	Past suppression efforts protected park staff and visitors	Thinning and prescribed fire activities might result in very minor impacts; long-term improvement in human health & safety with reduction in fuels	Similar effects as described in Past and Present Actions	Human health and safety would improve over time with thinning and prescribed fire activities; Fire Management Plan would not result in significant cumulative impacts; the Proposed Action Alternative would contribute the most to human health & safety cumulative impacts, while Alternative 3 would contribute the least
Air Quality	Industry and agricultural practices emit pollutants and particulate matter; automobiles, past wildland and prescribed fires contribute to some temporary deterioration in air quality and visibility	Prescribed fire emissions would result in minor, short-term air quality and visibility impacts	Future wildland fire programs would contribute to temporary deterioration in air quality and visibility	Class I air quality standards would not be violated; Fire Management Plan would not result in significant cumulative impacts; the Proposed Action Alternative would contribute the most to air quality cumulative impacts, while Alternative 3 would contribute the least
Cultural Resources	Establishment of the park helped protect cultural resources; past suppression efforts may have impacted un-recorded sites	Fuel treatments could result in impacts to un-recorded sites	Similar effects as described in Past and Present Actions	Cultural resources continue to be protected; Fire Management Plan would not result in significant cumulative impacts; the Proposed Action Alternative would contribute the most to cultural resources' cumulative impacts, while Alternatives 3 would contribute the least
Soils/Water	Adverse soil impacts (soil erosion or loss) from past roads, park buildings and improvements, wildland fires and suppression efforts; Beneficial soil impacts from past wildland fires (nutrification of soils)	Prescribed fire and thinning activities would have minor adverse effects on soils (soil erosion and compaction), but beneficial effects as well over the short and long-terms (soil development and soil nutrification)	Suppression efforts of large wildfires could adversely impact soils (compaction, erosion from firebreaks, etc.)	Soils inside of the park would improve over time with soil development and nutrification from prescribed fires; Fire Management Plan would not result in significant cumulative impacts; All alternatives would contribute similarly to soils cumulative impacts
Vegetation	Natural fuel loading increased in absence of historic low-severity, high frequency fire regime; native plant habitat and diversity declined; increased infestation of noxious weeds	Thinning and prescribed fire would decrease hazardous fuel loadings; native grass and forb species would be favored; forest stand structure in some areas would return to historic conditions; fire regimes would be returned to 12,075 acres	Thinning and prescribed fire efforts in the adjacent National Forests would reduce fuel loadings and help restore historic fire regimes to forest communities adjacent to the park; wilderness designation limits the ability of the park to reduce hazardous fuel loadings in wilderness areas	Habitat and diversity would continue to improve; noxious weeds would continue to decline; fuel loadings would pose a reduced fire danger; Fire Management Plan would not result in significant cumulative impacts; the Proposed Action Alternative would contribute the most to vegetation cumulative impacts, while Alternative 3 would contribute the least
Wildlife	Fire suppression efforts within the park degraded wildlife habitat and diversity; park building and improvements temporarily affect wildlife species	Thinning and prescribed fire would result in minor, short-term disturbance and displacement with minimal species loss; improved habitat and increased wildlife diversity with restoration of historic fire regime	Thinning and prescribed fire efforts in adjacent National Forests would help restore historic fire regime to forest communities adjacent to the park and benefit habitat and species diversity	Wildlife habitat and diversity increases; Fire Management Plan does not result in significant cumulative impacts; the Proposed Action Alternative would contribute the most to wildlife cumulative impacts, while Alternative 3 would contribute the least

Resource	Past and Present Actions	Proposed Actions	Future Actions	Cumulative Effects
Cave Resources	Establishment of the park helped protect cave resources; past suppression efforts may have impacted un-recorded entrances	Thinning and prescribed fire would result in minor, short-term disturbance and displacement with minimal species loss or structural damage	Future wildland fires programs would have similar effects as described in Past and Present Actions	Cave resources continue to be protected; Fire Management Plan would not result in significant cumulative impacts; All alternatives would contribute similarly to cave resource cumulative impacts
Wilderness	Past fire suppression in the park prevented wilderness areas from achieving historic fire regime and allowed for hazardous fuel buildup	Fire management activities would not result in significant impacts to wilderness with the implementation of mitigation measures; fire management activities would help reduce fuel loadings in the wilderness and contribute to improved forest health	Thinning and prescribed fire activities would help reduce fuel loadings in the wilderness and contribute to improved forest health	Wilderness would not be significantly impacted by proposed fire management activities; the Proposed Action Alternative would contribute the most to wilderness cumulative impacts, while Alternative 3 would contribute the least
Visitor Use and Experience	Establishment of the park, improved roads and trails provided access for recreation opportunities; increased population growth results in increased recreational use; proposed designation of wilderness improves recreational experience	Minor visitor use and experience impacts resulting from thinning and prescribed fire activities	Increased recreation use as population grows	Long-term enhancement of recreation resources and opportunities offsets short-term recreation inconveniences from fuel treatments; Fire Management Plan would not result in significant cumulative impacts; the Proposed Action Alternative would contribute the most to visitor use and experience cumulative impacts, while Alternative 3 would contribute the least
Socio-economics	Establishment of the park and visitor use benefits local and regional economies	Very minor effects on local economy	Similar effects as described under Past and Present Actions	Socio-economics would remain relatively unchanged; Fire Management Plan would not result in significant cumulative impacts; All alternatives would contribute similarly to socio-economic cumulative impacts

Chapter 4 – CONSULTATION AND COORDINATION NEED

4.1 Persons, Organizations, and Agencies Consulted

The following persons, organizations, and agencies were contacted for information and/or assisted in identifying important issues, developing alternatives, or analyzing impacts of this environmental assessment.

Al Augustine, Fire Management Officer, Lava Beds National Monument
Robert Bell, Battalion Chief, Doublehead District, Modoc National Forest
Keith Bryan, Fuels Management Specialist, Big Valley District, Modoc National Forest
Craig Dorman, Superintendent, Lava Beds National Monument
Jean Corrigan, Administrative Officer, Lava Beds National Monument
Kelly Fuhrmann, Natural Resource Specialist, Lava Beds National Monument
Rick Hardy, Wildlife Biologist, US Fish and Wildlife Service, Klamath Basin Field Office
Terry Harris, Chief Ranger, Lava Beds National Monument
Scott Isaacson, Fire Information Officer, Lassen Volcanic National Park
Dave Larson, Chief of Resource Management, Lava Beds National Monument
Doug Laye, Wildlife Biologist, US Fish and Wildlife Service, Klamath Basin Field Office
Rick Miller, Fire Researcher, Oregon State University
Francis Mohr, Private Consultant, Mohr Managed Fire, Inc.
Mike Powell, Prescribed Fire Specialist, Lava Beds National Monument
Mary Rasmussen, Fire Ecologist, Crater Lake National Park
Robert “Buck” Silva, AFMO- Operations, Devils Garden District, Modoc National Forest
Dave Sinclear, Klamath National Wildlife Refuge, U.S. Fish and Wildlife Service
Rick Smedley, Fire Planner, Pacific West Regional Office, National Park Service
Webb Smith, Private Consultant, Mangi Environmental Group
Joe Svinarich, Fire Archeologist, Whiskeytown National Recreation Area

4.2 List of Preparers

Al Augustine, Fire Management Officer, National Park Service
Dave Larson, Chief of Resource Management, National Park Service
Michael Powell, Prescribed Fire Specialist, National Park Service
Mary Rasmussen, Fire Ecologist, National Park Service

4.3 Persons, Organizations, and Agencies Who Will Receive This Environmental Assessment

This EA will be available for public review and comment for a 30- day period. A notice announcing its availability is being sent out to over 100 interested parties through the Monument’s mailing list, including federal, state, and municipal agencies, and individuals. Hard copies of the EA are being provided to area libraries in Klamath Falls, Oregon and Alturas, California. Hard copies of this EA are available upon request. This EA will be posted on the park’s website at: <http://www.nps.gov/labe>, under the “Management Docs” link, during the entire comment period. Hard copies of this EA are available upon request. This EA will be posted on the park’s website at: <http://www.nps.gov/labe/> during the entire comment period.

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